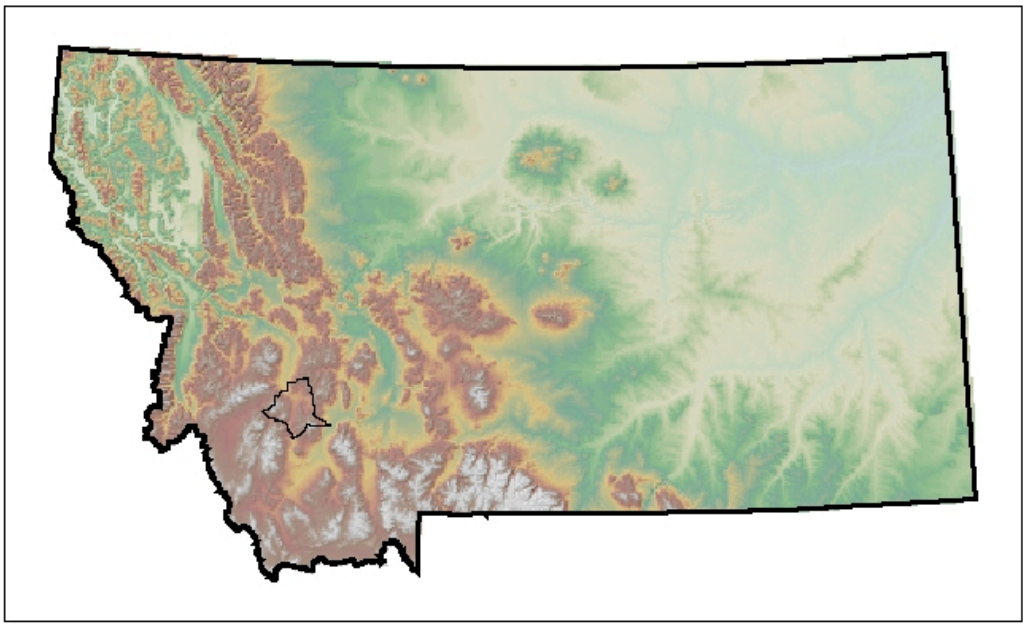
COMMUNITY WILDFIRE PROTECTION PLAN (CWPP)
Butte-Silver Bow County, Montana



Prepared under contract to:

HEADWATERS RC&D AREA, INC.
Economic Development District
305 W. Mercury, Suite 211
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Prepared for:

BUTTE-SILVER BOW
COUNTY, MONTANA

Prepared by:

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In cooperation with:

CONCERNED BUTTE-SILVER BOW
COUNTY STAKEHOLDERS

SEPTEMBER 2005

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IN WITNESS WHEREOF, the parties have caused this agreement to be executed by their authorized representatives, on the day and year first written above.

CITY-COUNTY

_____

PAUL DAVID BABB
CHIEF EXECUTIVE

ATTEST:

_____

MARY M. McMAHON
CLERK AND RECORDER

APPROVED AS TO FORM:

_____

ROBERT M. McCARTHY
COUNTY ATTORNEY

STATE OF MONTANA)
:ss.
County of Silver Bow)

On this _____ day of _____, 2005, before me, _____, a Notary Public for the State of Montana, personally appeared PAUL DAVID BABB and MARY M. McMAHON, known to me to be the Chief Executive and Clerk and Recorder, respectively, of the City and County of Butte-Silver Bow, a municipal corporation and political subdivision of the State of Montana, and acknowledged to me that they executed the written instrument on behalf of said municipal corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year in this certificate first above written.

_____

PRINTED NAME_____
NOTARY PUBLIC FOR THE STATE OF MONTANA
RESIDING AT_____
MY COMMISSION EXPIRES_____

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EXECUTIVE SUMMARY

The Community Wildfire Protection Plan (CWPP) for Butte-Silver Bow County, Montana has been developed through a contract between the Headwaters Resource Conservation & Development Area, Inc. (HRCD) and the Bureau of Land Management (BLM) with the cooperation and participation of Butte-Silver Bow County. The HRCD entered into a contract with Fox Logic, LLC (Fox Logic) of Florence, Montana to develop stakeholder collaboration, conduct stakeholder meetings, perform research, and carry out other activities necessary to produce a CWPP for Butte-Silver Bow County.

Purpose Statement

The purpose of the CWPP is the generation of management recommendations that protect values at-risk from wildfire in the wildland-urban interface (WUI) including lives, homes, businesses, and essential infrastructure (e.g., escape routes, municipal water supply structures, and major power and communication lines), with appropriate consideration for other community values.

To avoid confusion, the terms “goal” and “objective” are not used to describe the intent of the CWPP. Rather, a “purpose statement” is used to stimulate discussion for CWPP development.

Overview

Development at the edge of forest or grassland areas is conducted in what is referred to as the WUI. This unique zone where structures meet or intermingle with undeveloped wildland or vegetative fuels is an area with potential to be at an increased risk to wildfire. Characteristics that make the WUI an attractive area to live in also make fire fighting and emergency response dangerous, difficult, and very expensive. To make matters worse, a buildup of vegetation, resulting from decades of fire suppression, and recent drought have increased the risk and probability of catastrophic wildfire in many areas of the WUI. Through the development of a CWPP, Butte-Silver Bow County aims to reduce the risk of catastrophic wildfire and its potential consequences in the WUI.

The CWPP is a tool designed by and for at-risk WUI communities to pre-plan and improve their capability to negate and/or survive wildfire. The United States Healthy Forests Restoration Act of 2003 (HFRA) encourages the development of CWPPs. Section 101(3) describes a CWPP as a plan that:

1. Is developed in the context of the collaborative agreements and guidance established by the Wildland Fire Leadership Council and agreed to by the local government, local fire department, and state agency responsible for forest management, in consultation with interested parties and the federal land management agencies that manage land in the vicinity of an at-risk community;
2. Identifies and sets priorities for areas needing hazardous fuel reduction treatments and recommends the types and methods of treatment on federal and non-federal lands that will protect one or more at-risk communities and their essential infrastructure; and
3. Recommends measures to reduce the chance that a fire will ignite structures throughout an at-risk community.

Stakeholders and Plan Development

The development of the CWPP required active collaboration of interested Butte-Silver Bow County stakeholders. Principal CWPP stakeholders included the local government, the local fire departments, and the Montana Department of Resources and Conservation (MT DNRC), with technical support and resource management input also received from the United States Department of Agriculture: Forest Service (USFS) and BLM.

Fox Logic invoked discussions with and received feedback from the public, private organizations, and federal, state, and local agencies to identify wildfire risks, priority areas, priority projects, and mitigation activities. Planning was based on verbal input from stakeholder meetings held during the spring of 2005 and written responses submitted to Fox Logic by interested entities. Input from public stakeholder groups was additionally encouraged through solicitation letters sent directly to potential stakeholder groups and public notices published in local newspapers (Appendix A and Appendix B).

To further maximize stakeholder outreach, a draft of the Butte-Silver Bow County CWPP was mailed on CD ROM to a group of core stakeholders on August 10, 2005. After a two-week review period stakeholder comments were incorporated, and on September 7, 2005 the Final Draft, was posted via the Internet on the Fox Logic website. Notification of the Internet posting was issued through email/traditional mail to all previously identified stakeholders. Finally, copies of the completed document were sent to the HRC&D office and County Disaster and Emergency Services (DES) office in Butte in late-September 2005.

Healthy Forests Restoration Act (2003)

The purpose of the HFRA is to support projects that carry out fuel treatments in and around at-risk communities under the National Fire Plan and the Western Governor's Association, 2001, *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy*.

The HFRA provides monetary aid for at-risk communities that complete CWPPs and expedites National Environmental Protection Act (NEPA) procedures for authorized fuel reduction projects on federal lands in the WUI.

The USFS and BLM are directed in accordance with *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan* (May 2002) to:

- "Develop an annual program of work for Federal land" in Butte-Silver Bow County "that gives priority to authorized hazardous fuel reduction projects that provide for protecting at-risk communities or watersheds or that implement CWPPs" (HFRA Section 103(a)).
- Consider recommendations made in the Butte-Silver Bow County CWPP in the generation of annual work plans for federal land (HFRA Section 103(b)(1)).
- Provide that financial assistance for authorized hazardous fuel reduction projects on non-federal land in Butte-Silver Bow County will be allocated by federal agencies based on CWPP recommendations (HFRA Section 103(d)(2)).

The Wildland-Urban Interface

Section 101(16)(B)(ii)) of the HFRA offers a definition of Wildland-Urban Interface (WUI) but communities are also encouraged to use the CWPP process to derive their own definition of WUI within their county. Butte-Silver Bow County has defined its own WUI. The Butte-Silver Bow County WUI definition includes:

- A WUI protection area including and extending four miles from the HFRA-defined WUI
- An area extending one mile on each side of a primary egress/ingress route
- An area extending one mile on each side of a major power line

Protection Priorities

The Butte-Silver Bow County WUI was broken into four 1-mile-wide zones of diminishing protection priority extending concentrically away from the center of the WUI defined by the HFRA. Each protection zone is incrementally ranked with reduced protection priority as distance from the center of the WUI increases. Protection ranking is one of four factors used in determining mitigation priorities for the Butte-Silver Bow County CWPP.

Risk Assessment

To illustrate the level of wildfire risk and facilitate planning for Butte-Silver Bow County, the four WUI priority protection zones were used in conjunction with three other factors to delineate the WUI into high-, medium-, and low-risk land areas. Wildfire risk factors is determined by three factors:

- Potential Fire Behavior
- Ignition Probability
- Fire Regime Condition Class

The best available information, science, and technology were used in the prediction of Butte-Silver Bow County fire conditions. Three geographic information system (GIS) model/mapping projects provided information critical to the scientific evaluation of the County land area. In addition, local fire authorities were asked to evaluate their emergency response capabilities within their respective fire protection districts and throughout the County.

Implementation, Monitoring, and Review

County stakeholders generated a short list of wildfire mitigation strategies that may be used to reduce WUI risk conditions. Further higher detail planning will need to be completed before mitigation activity can occur. Higher detail plans will incorporate one or many of the following strategies ranked by order of decreasing level of consideration:

- Fuels Management
- Education/Prevention
- Planning
- Development
- Training
- Inter-Agency Cooperation

Building on the mitigation strategies outlined above, the CWPP also contains information on reducing risks to structures. Recommended measures specifically address issues immediately around and in the individual structures at-risk within the WUI. Concepts introduced are primarily borrowed from the Firewise™ program.

Possible fire mitigation action will be implemented according to a diminishing level of risk and is referred to in the Plan as a fire mitigation priority rating (FMPR). A 10-year schedule beginning in 2005 and ending in 2015 addresses very-high-risk and high-risk areas first, medium-risk areas second, and all remaining areas and previously treated areas last. It is anticipated that 10 and 5 percent of the first and second priority implementation acreages respectively can be treated by 2015. It is not expected that a significant area of third priority, low-risk areas and maintenance of previously treated areas will occur during the first 10-year CWPP implementation period.

To ensure appropriate implementation of the Plan, the formation of a Monitoring Committee is recommended. This committee formed under the auspices of the County Fire Council, should conduct a minor review every year and a major review of the Plan in year 9 of implementation. Major review can also be initiated at any time during the life of the CWPP as determined by the Monitoring Committee.

BACKGROUND

Location

Located in southwest Montana near the junction of Interstates 15 and 90, Butte-Silver Bow County is governed by a consolidated city-county structure (Figure 1). The County, which straddles and is flanked to the east by the Continental Divide, encompasses 718.4 square miles and contains mid- to high-elevation mountain ranges that extend to above 10,000 feet above mean sea level. Habitats range from dry grassland to juniper-pine steppes, with snowy alpine areas found at the County's north, east, and south periphery.

No large bodies of water exist in the County but small lakes, rivers, and streams can be found. Two rivers are found in the County: the Big Hole and the Clark Fork. The Big Hole River runs along half of the southwest county line and the County contains the headwaters of the Clark Fork River.

The city of Butte, located in the northeast portion of the County, represents the County seat. Butte is the largest city in the County and is at the heart of a rich mining heritage dating back to the mid-late 1800s. Historic mining activities in and around Butte provided much economic stability for the State of Montana during the late 1800s through the 1980s.

Climate

The United States National Weather Service station at the Butte airport has maintained a daily weather record since 1894. Record review indicates that the County is subject to a continental weather regime experiencing a maximum annual average daily temperature of 53.2 degrees Fahrenheit and minimum of 27.1 degrees Fahrenheit (WRCC 2004). The warmest month of the year is July with an average maximum temperature of 79.7 degrees Fahrenheit and the coldest is January with an average low of 7.3 degrees Fahrenheit.

Weather in Butte-Silver Bow County is heavily influenced by the Continental Divide and is highly variable as a result of this geologic feature. During the winter months, low-pressure weather systems may stall behind the Divide, resulting in drastically colder temperatures to the east. Average annual precipitation in Butte is 12.76 inches: June is the wettest month (2.27 inches) and February is the driest (0.53 inches).

Local small-scale variability in temperature and moisture occur throughout the County because of natural terrain variation. Generally, moisture levels tend to be highest at middle elevations, on north-facing slopes, and in sheltered valleys (Barnes et al. 1998). Relatively dry sites can be found on low south-facing sites and high-elevation windy ridges. Temperature is also affected by terrain. High-elevation terrain and shaded, north-facing slopes at lower elevations exhibit colder temperatures. Low-elevation sites and south-facing slopes tend to be warmer.

POPULATION AND DEVELOPMENT

Once a bustling center of northern U.S. economics and culture, Butte-Silver Bow County had a population of nearly 60,313 people in 1920 but has experienced a significant loss in population since the peak of the mining era. Total County wide population in 2003 was estimated by the U.S. Census Bureau to be approximately 33,208 people; a further drop from 33,941 during the 1990 census (US Census 2000). Today the majority of county residents live in or within a short distance of the city of Butte or town of Walkerville.

Although Butte-Silver Bow County has not experienced the population influx seen in many communities in western Montana, the County has seen growth in the number of developments where the wildland and the urban setting commingle.

Wildland-Urban Interface

Developed land at the wildland interface is referred to as the wildland-urban interface (WUI). More specifically, the WUI is referred to as “the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels,” as stated in the Glossary of Wildland Fire Terminology (NWCG 1996). The tremendous risk to life, property, and infrastructure in WUI communities and the dangerous and complicated situations firefighters face in these areas have helped drive community wildfire protection planning efforts.

Butte-Silver Bow County has many areas were structures and undeveloped wildland commingle with approximately 594 houses outside the major urban area of Butte and Walkerville (MT NRIS 2005). WUI issues are not just a local problem; an estimated 42 million homes or 37 percent of the nation’s total homes lie within the WUI. These lands constitute 273,000 square miles or nine percent of the lower 48 states (Stewart et. al. 2003). Specific WUI issues and statistics including exact size, extent, and changes within have not been well identified.

LAND AND FIRE

A large percentage of terrain in Butte-Silver Bow County consists of rolling hills or rugged mountains separated by an area of broad open valley running north-south through the center of the County. Sagebrush-juniper habitat, coniferous forest, and in many places, coniferous forest with a deciduous quaking aspen or mountain alder component, occur throughout the upland area of the County (Figure 2). Tree species found in the County include Douglas fir, black cottonwood, grand fir, juniper, lodgepole pine, quaking aspen, sub-alpine fir, western larch, and whitebark pine. Wildland structure and composition are highly variable and change naturally with elevation, aspect, geology, and fire history.

A significant portion of the County's land area is covered with a mosaic of forest and grassland that was historically important for mining, logging, and cattle ranching. During the early half of the 1900s heavy copper mining activity precipitated the use or removal of a very large portion of the forest overstory present in the County. A limited amount of the large-scale resource extraction continues to occur, primarily with the reopening of the East Continental Pit in 2004, but nowhere near the amount witnessed historically. Agriculture continues to play an economic role in Butte-Silver Bow County; the largest portion of the County's economy is now based on the services industry.

Land Ownership/Administration

Land in Butte-Silver Bow County is owned/managed by four primary entities: private non-industrial landowners, USFS (Beaverhead-Deerlodge National Forest), Bureau of Land Management (BLM), and MT MT DNRC (Table 1)(Figure 3). The Humbug Spires Primitive Area, a BLM wilderness study area (6,945 Acres), exists in the south-central portion of the County.

Administrator / Owner	Acres	% of Total
Private	196,632	42.80
U.S. Forest Service	190,211	41.40
Bureau of Land Management	45,747	10.00
Other State Land	13,848	3.00
State Trust Land	13,308	2.90
TOTAL	459,746	

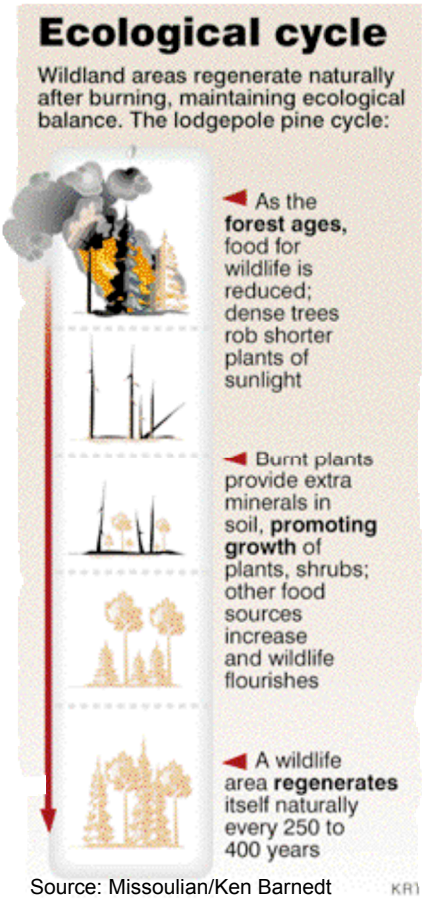
Source - MT NRIS 2004

Table 1 – County Land Administration / Ownership

Historic Fire Occurrence

In Butte-Silver Bow County and throughout the inter-mountain west, the majority of wildfires occur in July, August, and September. During these months high temperatures, dryness, and an increased incidence of lightning strikes create conditions conducive to the ignition and rapid spread of wildfire.

Before European settlement during the 1800s, numerous large and small fires occurred periodically throughout the region. Area forests have been historically subject to a specific natural fire regime. USFS researchers, Agee 1993 and Brown 1995, describe the role of naturally occurring fire in the absence of modern mechanical intervention. These natural fire regimes fall into one of five accepted historic fire regimes further developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001): (1) frequent, low-severity; (2) frequent, high-severity; (3) moderate-frequency, mixed-severity; (4) moderate, high-severity; and (5) infrequent, high-severity fires. An illustration of the ecological cycle and the natural role of fire in an infrequent, high-severity fire regime lodgepole pine forest is depicted below.



During the 20th century, fire policies dictated that public land management agencies and private landowners suppress wildfires throughout the west, including Butte-Silver Bow County. These policies were likely the result of a desire by the public to protect the aesthetic beauty of the forest as well as the notion that fire destroyed monetary returns from forest products. Fires have been construed, by many, as a destructive force, one that needed to be eliminated as soon as possible.

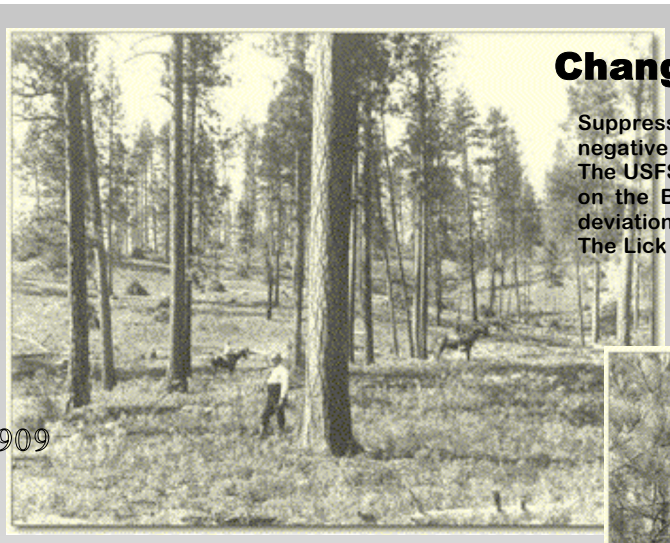
Policies and attitudes have changed, and fire within the Butte-Silver Bow County landscape is now considered by many to be natural and necessary for the general health of the greater regional ecology. Widespread fire suppression has denied the natural role of a major ecological force in forests and has generally resulted in negative impacts to forest health within the inter-mountain west. The negative impact of fire suppression can be observed in the forested areas of the County, of which many are over-stocked, insect- and disease-infested, and fire-prone. Devastating insect outbreaks alone in western Montana's forested areas affected nearly 200,000 acres in 2004 (Meyer 2004). Deteriorating forest health and vigor, resulting largely from fire exclusion, sustained drought, and increased development in remote areas has resulted in a potentially high- risk WUI fire situation.

Many area forests ecologically adapted to burning as frequent, low-severity; moderate-frequency, mixed-severity; or infrequent, mixed-severity fire regimes now, once ignited, burn as an infrequent, high-severity fire that threatens human life, structures, and the environment.

Changing the natural fire regime

Suppression of natural wildfire has resulted in ecologically negative and visually dramatic changes to wildland areas. The USFS photo progression from the Lick Creek study area on the Bitterroot National Forest visually represents the deviation in natural fire regime from a FRCC1 to an FRCC3. The Lick Creek photo series is a Fire Behavior Fuel Model 2.

FRCC1



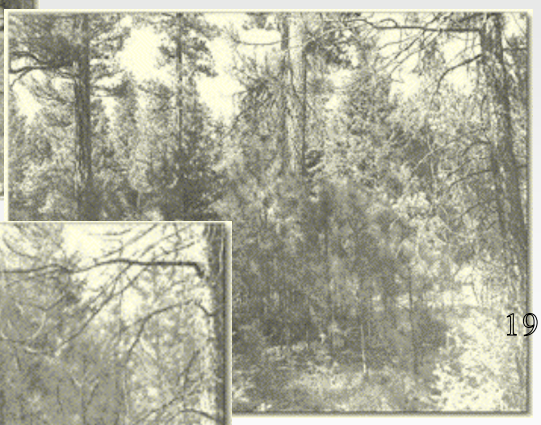


Photo Source: USFS

FRCC3

Forests exhibiting a change of fire regime are classified by departure from the natural fire regime by fire regime condition class (FRCC) (Hann and Bunnel 2001).

It has been suggested by Dr. Stephen Arno, a leading fire ecologist recently retired from the USFS, that "(h)igh fuel loadings," caused by fire exclusion, "eventually will be reduced by decay, fire (wildfire or prescribed fire), or removal" (Arno 1976). Forest fuel decay is too slow due to the cool, dry nature of the region's forests in Arno's opinion, so where fuel reduction programs are not established, nature may reduce fuel loads through large, uncontrolled wildfire (Arno 1976). Recent major fire years may provide support for this hypothesis.

Though fire suppression continues to be very good, with the majority of fires being extinguished while small, an increase in the average size of fires that cannot be suppressed, and the frequency with which those fires threaten the WUI is on the rise. It is these wildfires, and the potential for local catastrophic wildfire, which alarms fire managers and most citizens. Luckily, recent large damaging fires have not had high environmental, social, and economic impact on Butte-Silver Bow County, but increasing statistical probability of more damaging wildfire(s) in the County's WUI continues to rise as wildland conditions deteriorate and interface development continues to rise.

Local Fire Statistics

Fires that occur in Butte-Silver Bow County are recorded in a database managed by the commanding fire agency. Because each fire respondent maintains their own record of a fire there are two primary databases for which fire information has been compiled for Butte-Silver Bow County. These two fire databases, one for federal agencies and one for the MT MT DNRC information, were consulted to provide historic information on wildfire within Butte-Silver Bow County.

The USFS and BLM fire records were compiled using the FireFamily Plus software package in which fires have been recorded since 1968. The software allows the user to assess and report many fire factors including fire year, size, and cause. Data queries for Butte-Silver Bow County proper were not possible due to fire statistics being broken out by agency management areas, which do not correspond to County boundaries.

Table 2 on the next page was generated from user specified variables, input into FamilyFire Plus, to query federal agency fires on the USFS Beaverhead-Deerlodge National Forest, Butte Resource District and BLM Butte District. Though the agency management areas queried cover an area greater than Butte-Silver Bow County, the fires reported are representative and do include fires in Butte-Silver Bow County proper. Table 2 provides a concise summary of historic wildfires that have occurred in and around the County that were responded by federal agencies.

According to the output generated by FamilyFire Plus software and the MT MT DNRC database (records compiled since 1981), a total of 2062 fires have burned 171,459 acres. The majority of fires occurred in the month of August, were most often caused by lightning, were most often less than one acre in size, and generally lasted less than one day before being extinguished.

A combined analysis of federal agency and the MT MT DNRC data indicates 57% of fires were caused by lightening and remaining 43% were human caused. Of the total human-caused fires, an alarming 46% were caused by mechanical equipment, such as automobiles or forest equipment, and 45% were caused by escaped debris burning fires.

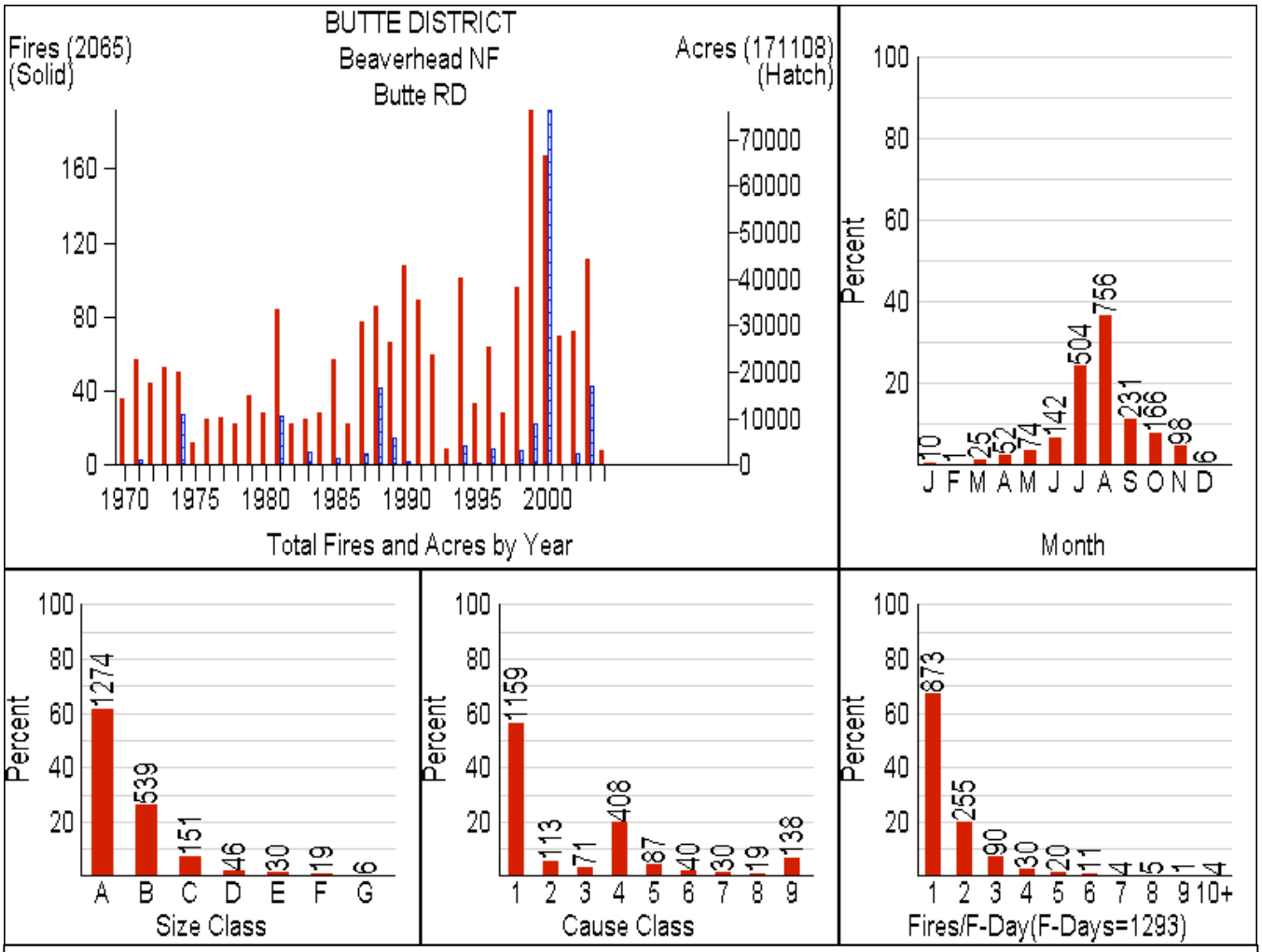


Chart Legend

Size Class (acres) – A (0-0.2), B (0.3-9.9), C (10-99.9), D (100-299.9), E (300-999.9), F (1000-4999.9), G (5000+)

Cause Class (type) - 1 (Lightening), 2 (Campfire), 3 (Smoking), 4 (Debris Burning), 5 (Arson), 6 (Equipment), 7 (Railroad), 8 (False alarms), 9 (Powerline)

Table 2 – Butte-Silver Bow County Area Federal Agency Fire Statistics

VALUES AT RISK

Butte-Silver Bow County stakeholders have identified values at-risk to loss during catastrophic wildfire. As set forth in the Montana Code Annotated (7-33-2202), Butte-Silver Bow County is responsible for the protection of the County's range, farm, and forestlands from fire. This statute aims to protect areas with manmade and natural values at-risk from wildfire. Specific values at-risk within the WUI include lives, homes, businesses, historic structures/districts, and essential infrastructure (e.g., escape routes, municipal water supply structures, and major power and communication lines). Natural values at-risk include surface water quality, ecological stability, and forest resource health.

Risk Defined…

Function: noun
Etymology: French risque, from Italian risco
1 : possibility of loss or injury : PERIL
2 : someone or something that creates or suggests a hazard
3 a : the chance of loss or the perils to the subject matter of an insurance contract; also : the degree of probability of such loss b : a person or thing that is a specified hazard to an insurer <a poor risk for insurance> c : an insurance hazard from a specified cause or source <war risk>

Source: Merriam-Webster Dictionary

Though all values at risk, described below, are considered very important and deserve protection from the impact of wildfire, the protection of human life is of paramount importance, then the protection of critical infrastructure, structures and improvements, followed by protection of forest resource values.

Human Life

Loss of non-firefighter life due to wildfire is not statistically high but is of paramount importance to prevent. It is estimated that as many as 1,224 residents live in the Butte-Silver Bow County WUI. These individuals are not likely to stay in harms way during a wildfire they may be inadvertently at risk of being trapped and killed during a catastrophic fire. Evacuation policies are in place for the County and are discussed at greater length in the Butte-Silver Bow County Evacuation Plan document at the Butte-Silver Bow County DES office.

Where civilians may not likely to be present during a wildfire event, firefighters will likely be in the area. Firefighters are faced with trying to protect natural and manmade values and human-life from wildfire while not placing themselves in peril. Though very well-qualified and trained to do their job the dangerous conditions they encounter are continually changing and pose a constant threat to life. No record of fire-cause fatalities could be found for Butte-Silver Bow County.

The National Wildfire Coordinating Group (NWCG) has developed a system, the fire danger pocket card, to better inform firefighters of the local-current fire danger. Factors that increase firefighter danger vary with geographic region, local weather, vegetation type, slope, time of year, and time of day. The pocket card is developed using historic local weather conditions and a fuels model representative of a wildland area currently burning. The card also presents condition data that has lead to previous major wildfires in the area.

An index such as the Energy release coefficient (ERC), derived on a day-to-day basis by fire behavior specialists, is given to firefighters at the daily fire event briefing. An interpretation of

fire danger can be made from that day's index using the pocket card. An example of one possible Butte-Silver Bow County area pocket card is presented in Table 3.

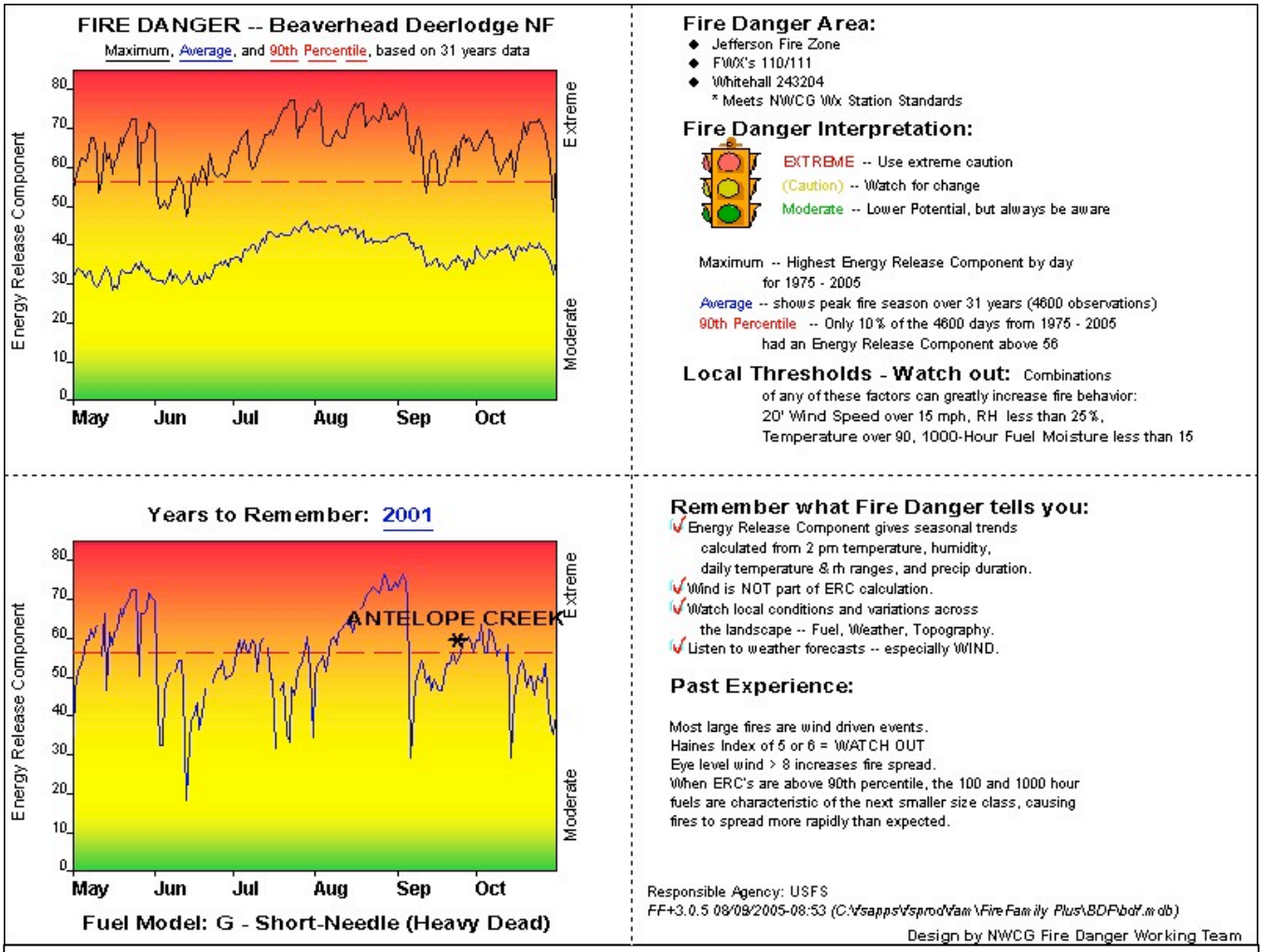


Table 3 – Butte-Silver Bow County Area Fire Danger Pocket Card

WUI Structures

The monetary value of WUI homes is estimated using 2000 US Census data and the Montana Natural Resource Inventory System (MT NRIS). The total houses were estimated from a count of the groundwater source wells servicing WUI households in the WUI. Total WUI houses are estimated at 594.

Though houses of remarkable monetary value may be present in the WUI this study multiplied the 2000 US Census average house value for Butte-Silver Bow County, $74,900, by the number of estimated WUI houses. Cumulative WUI housing value was determined at $44,490,600. This value reflects only the monetary WUI house value and does not account for improvements or personal effects that may be lost to wildfire.

Significant Sites

The *National Register of Historic Places* contains sixteen listed sites in Butte-Silver Bow County, fourteen of which are located within the city of Butte (National Park Service 2004). The remaining two sites include the Big Hole Pump Station located along U.S. Highway 43 and the Anaconda and Pacific Railway Historic District running between the confluence of German Gulch and Silverbow Creek near Butte and running along Silverbow Creek to Anaconda. There may also be mining sites throughout the County not listed in the Historic Register that are of historic significance to the community.

Suggesting a monetary value for historic sites in general seems trivial, as their benefits to society are invaluable.

Forest Resources

The monetary value of the forest in Butte-Silver Bow County is difficult to assess as its values for recreation, aesthetics, carbon sequestration, clean water, etc. are difficult to quantify and may be considered by some to be invaluable.

Assigning a monetary value for standing timber, as a potential commercial resource is easier to calculate. Currently there are approximately 67,880 acres of commercial timber in Butte-Silver Bow County (HRC&D 2005). Using the taxable dollar value for fair value forestland of $599.25/acre provided by the Montana Department of Revenue (MT DOR 2005), the total taxable value the County's forestland totals $40,667090.

FIRE PREPAREDNESS

A community's ability to fight wildland and/or structural fire once ignited is determined by its capacity to respond, confine, contain, and control a fire incident. Butte-Silver Bow County has 34 full time fire personal at the Butte Fire Department and over 150 volunteers representing two rural fire districts with 11 volunteer departments charged with primary response to emergency wildfire incidents throughout the County. The volunteer fire department (VFD) crews also work with USFS, BLM, MT MT DNRC, and municipal fire departments to provide initial attack response and support for these fire incidents. Wildfire protection agreements are in place to provide mutual aid between all capable response departments and agencies for the County and adjacent counties. Fire suppression jurisdictions for each of the agencies or departments are depicted in Figure 4.

VFD personnel are skilled, trained, and equipped to respond to many WUI wildfire incidents. During bad wildfire years, VFD crews and equipment have been pushed to the limit of their response capabilities. Continued interface development, further forest condition deterioration, increasing live and dead forest fuel concentration, and sustained drought have the potential to place even greater demands on fire response crews.

Butte-Silver Bow County has recently completed a pre-disaster mitigation plan (PDM) with the aim to improve overall emergency preparedness for the County where necessary. The PDM recommendations and conclusions overlap the CWPP in the area of County fire defense and preparation.

Critical Facilities At Risk

Fire preparedness depends on resources being available for firefighting. Critical facilities in the WUI that are at risk to potential catastrophic wildfire include the Little Basin Creek VFD Station. This Station is critical to fighting wildfires and loss of the structures as a result of fire would in turn leave inadequate firefighting resources within the County. The Little Basin Creek VFD volunteers have created an area around the structures that will enable defense from wildfire.

Please refer to the PDM for further information and discussion of critical- and non-critical facilities and vulnerable structures in the remainder of the County.

Evacuation Plan

Butte-Silver Bow County evacuation policies have been developed. It is suggested that that further wildfire evacuation planning be undertaken. Wildfire evacuation routes, marshalling points, and procedures need to be pre-established for the County. Principal evacuation routes as outlined in the Fire Smart manual (2003) should:

- "Lead away from an approaching wildfire to a safety zone" such as large irrigated agricultural areas.
- "Be designed with consideration of prevailing winds and avoid areas of dense forest fuels along the route.
- Be wide enough for two-way traffic (consider incoming fire emergency vehicles).

- Be well marked with standard signage. Road surface and grade should be suitable for two wheel-drive cars."

WUI residents and homeowner associations should also be encouraged to preplan for evacuation scenarios and familiarize themselves with the evacuation plan.

Critical Egress/Ingress Routes

Access to and from populated areas of the County is important for emergency response for firefighters and for residents during a catastrophic fire event. Firefighters need trouble-free access to and from subdivisions so that they may provide the most effective response for structure and life protection. Residents also need the opportunity to retreat from WUI areas in the face of wildfire.

Many populated areas throughout western Montana, including Butte-Silver Bow County, have subdivisions with only one route of egress/ingress, roads of inadequate width, bridges of limited weight-bearing capacities, and high fire fuel loads within close proximity to the roadway. These are just some of the many situations that may compromise the protection and evacuation of WUI areas.

Nearly all of Butte-Silver Bow County's existing WUI subdivision access roads have at least one egress/ingress risk element listed above in need of improvement. Many have multiple problems. Many subdivision roads were originally established for resource extraction purposes needs and now would greatly benefit from multiple egress/ingress risk mitigation improvements to allow safe access and escape for a growing number of residences using the roads for residential access.

Though there are many roads in Butte-Silver Bow County that may be compromised in the event of wildfire, one of significant importance, in an area of elevated risk is MT Highway 2 through the Pipestone Pass area. This highway is of significant importance as is a primary access route out of Butte-Silver Bow County. The area is also a priority for adjacent Jefferson County residents.

Fire Fighting Equipment

Fire departments in the County are equipped with numerous wildland firefighting tools and techniques. Information gathered from the fire chiefs through meetings and correspondence indicated that no major equipment shortages exist but did indicate that training and volunteer recruitment, as well as general equipment inventory can always be improved. It is recommended that excessively old engines/tenders in questionable condition or equipment with outdated or hard to find parts must be upgraded within the next five years. Table 4 lists the resources available in the County as described in the.

Other equipment is available to County fire departments through equipment loan from the MT MT DNRC and through cooperative aide agreements such as the *Butte-Silver Bow 2004 County Annual Wildfire Operating Plan*.

The fire departments appear to be moderately well equipped to provide initial attack response to a wildfire event within the County.

Development Requirements

No development regulations regarding wildfire protection are present in Butte-Silver Bow County. The Butte-Silver Bow Subdivision Regulations do however present recommendations for subdivisions located in areas of high fire hazard. To summarize, Section 11 of the Regulations, subsection K and L, addresses general wildfire protection and fire protection in areas of high hazard.

The Section K: Fire Protection addresses general wildfire protection and recommends “All subdivisions must be planned, designed, constructed, and maintained so as to minimize the risk of fire and to permit the effective and efficient suppression of fires in order to protect persons, property, and forested areas.” The regulations further suggest that development will occur with fire safe structure placement, adequate fire fighting facilities and water distribution infrastructure, be covered under emergency fire protection service, and be kept clear of dead forest fuel within 100 feet of structures.

A second section of the subdivision regulations, Section L, pose recommendations for proposed subdivisions in high wildfire hazards areas. The regulations suggest that there should be:

- At least two routes of egress-ingress
- Road right-of-way should be cleared of slash
- Bridges should be built to a design load of 20 tons and constructed of non-flammable materials
- Building sites should not be located on slopes greater than 25 percent and at the apex of "fire chimneys”
- Forest density (thinning) standards
- Green belt creation
- Sufficient supply and volumes of water for consumption and fire fighting purposes
- Where used roofing shakes will be constructed of artificial materials or approved treated natural shakes
- Gas storage tanks should be located at least twenty (20) feet from residential structures

Required adherence to these current high-risk wildfire development recommendations needs to be contemplated by local government.

Big Butte V.F.D.
500 gal. engine w/1000 gpm pump, 1969 Am. LaFrance (F-31)
250 gpm portable pump

Boulevard V.F.D.
1,000 gal. engine w/1500 gpm pump, 1997 Freightliner (F-65)
200 gal. engine w/??? gpm pump, 2005 Ford
2,000 gal. tender w/??gpm pump, 2005 Freightliner (F-17)
1,200 gal. porta-tank

Butte F.D.
300 gal. engine w/1000 gpm pump, 1966 Mack (F-1)
1,000 gal. engine w/1000 gpm pump, 2000 Freightliner (F-2)
500 gal. engine w/1250 gpm pump, 1975 Mack (F-3)
750 gal. engine w/1500 gpm pump, 1988 Mack (F-4)
750 gal. engine w/1500 gpm pump, 1996 Central States (F-5)
Ladder Truck, 1967 Mack (F-7)

Centerville V.F.D.
500 gal. engine w/750 gpm pump, 1975 International (F-36)
1000 gal. tender w/250 gpm pump, 1975 International, 6 Pass.(1128)*
1,500 gal. tender w/300 gpm pump, 1966 International (317)*

Floral Park V.F.D.
200 gal. engine w/250 gpm pump, 1977 Dodge 4x4 (F-47)
200 gal. engine w/750 gpm pump, 1960 Mack (F-46)

Home Atherton V.F.D.
500 gal. engine w/1,000 gpm pump, 1975 Ford (F-42)
1,500 gal. tender w/250 gpm pump, 1979 International (F-41)
1,200 gal. porta-tank

Little Basin Creek V.F.C.
200 gal. engine w/350 gpm pump, 1980 Chevrolet 4x4 (F67)
200 gal. engine w/100 gpm pump, 1991 Chevrolet 4x4 (F68)
500 gal. engine w/275 gpm pump, 1970 International 4x2 (1070)*
250 gpm portable pump
1,500 gal. porta-tank

Melrose V.F.D.
1,500 gal. engine w/750 gpm pump, 1978 Am. LaFrance (F-62)
2,200 gal. tender w/750 gpm pump, 2003 Ford with 2,200 gal. porta-tank
300 gal. engine w/100 gpm pump. 1988 Ford 4x4
200 gal. engine w/100 gpm pump, 1982 GMC 4x4 (925) *
1,100 gal. engine w/750 gpm pump, 1967 International (275) *

Racetrack V.F.D.
500 gal. Engine w/1250 gpm pump, 1971 Am. LaFrance (F-26)

Rocker V.F.D.
750 gal. engine w/750 gpm pump, 2000 Freightliner, 4x4 + foam (F-52)
200 gal. engine w/100 gpm pump, 1990 Chevrolet, 4x4 + foam (372) *
2,000 gal tender w/500 gpm pump, 2002 Freightliner, (F-53)
2,500 gal. porta-tank

Terra Verde V.F.D.
750 gal. engine, w /750 gpm pump, 2000 Freightliner, 4x4 (F-21)
5,000 gal. tender w/500 gpm pump, 1968 Mack (F-22)
1,500 gal. tender w/500 gpm pump, 1974 Ford
200 gal. engine w/100 gpm pump, 1983 GMC 4x4 (962) *
200 gal. engine w/100 gpm pump, 1986 Ford
1,200 gal. porta-tank
5,000 gal. porta-tank

Walkerville V.F.D.
500 gal. engine w/750 gpm pump, 1975 Chevrolet (None)
200 gal. engine w/100 gpm pump, 1983 GMC 4x4 (959) *

Butte/Silver Bow Shop

1 ea	D7 Dozer
1 ea	D8 Dozer
5 ea	Graders
4 ea	3,000 gallon water trucks
2 ea	1,200 gallon water trucks

* State owned equipment loaned to Butte/Silver Bow

DNRC:

Anaconda Unit Office
300 gal. engine w/100 gpm pump, 2001 Ford 4x4 (1538)
300 gal. engine w/100 gpm pump, 2002 Ford 4x4 (1568)
300 gal. engine w/100 gpm pump, 2004 Ford 4x4 (1642)
500 gal. engine w/250 gpm pump and porta-tank 1982 IHC (765)
Pump trailer with/2 ea portable pressure pumps and 1,600' hose
Portable volume pump
Cargo truck, 1 ton
6 passenger suburban
Honda trail bikes, 2 each
Polaris ATV, four wheel

Garrison Initial Attack Station
300 gal. engine w/100 gpm pump, 2000 Ford 4x4 (1525)
300 gal. engine w/100 gpm pump, 2002 Ford 4x4 (1567)

200 gal. engine w/100 gpm pump, 1994 Ford 4x4 (1671)
200 gal. engine w/100 gpm pump, 1997 Ford 4x4 (1064)
750 gal. engine w/250 gpm pump and porta-tank, 1999 International 4x4 (1040)
Pump trailer, w/1 each portable and floating pressure pumps and 1,600' hose
Honda trail bike
Polaris ATV, four wheel

Table 4 - Cooperative Fire Equipment

FIRE AND WILDLAND-URBAN INTERFACE RISK

Butte-Silver Bow County's risk from wildfire is largely determined by a combination of four factors: the area of the county that lies within a defined Wildland-Urban Interface; what values are at-risk to wildfire in the defined WUI; the susceptibility of those values to wildfire; and the ability of the community to protect those values.

Defining the Butte-Silver Bow County Wildland-Urban Interface

It is the opinion of Fox Logic and the Butte-Silver Bow County stakeholders that there is no single definition of WUI that will work in all areas at-risk to wildland fire across the nation. The Butte-Silver Bow WUI definition builds upon the nationally recognized HFRA WUI definition.

At the stakeholder meetings and through electronic and traditional mail correspondence stakeholders were asked what they expected from the WUI definition and presented with examples of other existing definitions from the local and national level. The following WUI definition was developed based on stakeholder comment and reaction.

Healthy Forest Restoration Act Wildland-Urban Interface

National HFRA WUI mapping has been compiled in part with funding by the USFS North Central Research Station and completed by the Applied Population Laboratory (APL) at the University of Wisconsin and Spatial Analysis for Conservation and Stability (SILVIS) at the Department of Forest Ecology and Management, Madison, Wisconsin. The SILVIS project used the following definitions and data to compete the HFRA WUI identification and mapping (Stewart et al. 2003):

- Housing Density

"Housing density information was derived from U.S. Census data. Analysis was conducted at the finest demographic spatial scale possible, Census blocks, from the 2000 Census. All measures of housing density are reported as the number of housing units per square kilometer."

- Landcover

"We utilized the National Land Cover Dataset (NLCD), a satellite data classification produced by the USGS with 30m resolution based on 1992/93 imagery and available for the entire U.S. (Vogelmann et al. 2001) to identify 'wildlands.' Our definition of 'wildlands' encompasses a range of management intensities. NLCD classes that we included as 'wildlands' are forests (coniferous, deciduous and mixed), native grasslands, shrubs, wetlands, and transitional lands (mostly clear-cuts). We exclude orchards, arable lands (e.g., row crops) and pasture."

- Wildland-Urban Interface (WUI)

"WUI is composed of both interface and intermix communities. In both interface and intermix communities, housing must meet or exceed a minimum density of one structure per 40 acres (16 ha). Intermix communities are places where housing and vegetation intermingle. In intermix, wildland vegetation is continuous, more than 50 percent vegetation, in areas with more than 1 house per 16 ha. Interface communities are areas with housing in the vicinity of contiguous vegetation. Interface areas have more than 1 house per 40 acres, have less than

50 percent vegetation, and are within 1.5 mi(le) of an area (made up of one or more contiguous Census blocks) over 1,325 acres (500 ha) that is more than 75 percent vegetated. The minimum size limit ensures that areas surrounding small urban parks are not classified as interface WUI."

The SILVIS project identified a total of 3,267.8 WUI interface acres and 13,664.1 acres of WUI intermix, for a total of 16,931.97 acres of total WUI in Butte-Silver Bow County (Stewart et al. 2003).

Butte-Silver Bow County Wildland-Urban Interface

To ensure Butte-Silver Bow County values are adequately protected during an extreme wildfire event it is necessary to expand upon the HFRA WUI defined by the SILVIS project. The following areas are included in the Butte-Silver Bow County WUI definition:

- WUI Protection Buffer

A WUI protection area or buffer extending 4 miles out from the edge of the HFRA-defined WUI is included in the Butte-Silver Bow County WUI. This protection area provides a distance away from values at-risk within the WUI in the event of extreme wildfire behavior. The buffer is designed to better ensure adequate emergency protection in the event of a catastrophic crown fire.

Source: Missoulian/Ken Barnedt

Crown fires are supported mainly in foliage (fuels) of the upper tree canopies in densely forested areas. Crown fires may promote spot fire ignition caused by convection-carried firebrands ahead of the main fire front making a fire much more difficult to contain, confine, and control. Not all wildland fires "crown," but when the condition occurs it is one of the

fastest spreading and most intense types of fire, posing an especially high risk to human life and County values in the WUI. Therefore, crown fire duration and rate of spread (ROS) were key factors used in the determination of a WUI crown fire buffer in the northern Rocky Mountains.

The 4-mile WUI definition adopted by Butte-Silver Bow County is based on scientific modeling and research published in *Predicting Behavior and Size of Crown Fires in the Northern Rocky Mountains* (Rothermel 1991). Mr. Duane Harp, District Ranger, USFS, Helena National Forest completed interpretation and application of Rothermel's research.

Mr. Harp offered the two following methodologies and calculations, based on Rothermel's research, to derive an optimum WUI buffer distance that would minimize risk to community values during a crown fire and maximize emergency response opportunity. The calculations show how a fire may burn during a theoretical worst-case scenario crown fire.

WUI Buffer Calculation

Rothermel's research included the study of seven actual fires that produced crowning conditions. The fires occurred for a period of between two and five hours duration, with an average duration of 3.5 hours.

The average forward ROS of the seven crown fires was 1.4 miles per hour.

The average fire duration multiplied by the average ROS resulted in the determination of total distance the head, or front, of the fire spread during an average crown fire.

The average fire duration multiplied by the average ROS resulted in the determination of total distance the head of the fire spread during an average crown fire, 4.9 miles.

Alternatively, Rothermel's crown fire research data was used to calculate individual spread distances for each of the seven crown fires separately. Individual fire spread distances were summed and then divided by the total number of fires. The resultant number is equal to the average distance of fire spread, 3.7 miles.

Mr. Rothermel's research and Harp's calculations indicate that the 1.5-mile HFRA WUI area is not an adequate safety buffer during a worst-case crown fire scenario. Therefore, an expanded WUI protection area extending 4 miles outside the HFRA-defined 1.5-mile WUI will allow for better protection of values at risk from the forward progression of an encroaching fire where fire crowning conditions may exist. While the majority of wildfires are typically extinguished when small, the aforementioned methodology accounts for the minority of fires that cannot be caught and that become large running crown fires in heavy wildland fuels. The calculated 4-mile buffer should allow enough time (3.5 hours) for emergency crews to respond and complete evacuations during the worst-case fire.

Problem WUI Road
Photo Source: Russell Fox

- Road Buffer

Primary and secondary highways that provide egress/ingress for County residents and fire protection departments/agencies were assigned a 1-mile buffer. It is also suggested that subdivision roads required for egress/ingress but not covered by the two other WUI buffer areas be buffered to the maximum easement width. Road buffers will also serve as firebreaks for fire containment.

- High Voltage Power Line Buffer

High voltage power lines (>250 Mega Volt) were assigned a 1-mile buffer as a protective measure to ensure that the County power supply can be adequately protected during a wildfire event and to reduce the probability that a power line fire ignition will travel beyond the power line corridor. Power line buffers will also serve as firebreaks for fire containment.

Priority Protection Zones

To allow for systematic prioritization of the Butte-Silver Bow County WUI for fire protection, it was necessary to delineate the 4-mile WUI buffer area, described in the previous section, into 1-mile increments of diminishing priority. It was assumed that a decrease in density of values at-risk as well as an increasing emergency incident response time would occur linearly with greater distance from the WUI centerline. Therefore, there is a decreased total incident protection need as there is decreased density of values. WUI priority protection zones were delineated in 1-mile increments as follows:

- Zone 1 – acreage including and extending 1 mile from the HFRA WUI interface/intermix.
- Zone 2 – acreage between 1 and 2 miles from the interface/intermix boundary.
- Zone 3 – acreage between 2 and 3 miles from the interface/intermix boundary.
- Zone 4 – acreage between 3 and 4 miles from the interface/intermix boundary. Zone 4 also includes buffer and power line buffer acreages.

The area within zone 1, assigned the highest WUI priority protection zone ranking, accounts for the highest density of values at-risk in the WUI and therefore receives the highest priority for protection; subsequently zones 2 through 4 were assigned a decreasing priority ranking (Figure 5). The WUI priority protection zone acreages by administration/ownership for Butte-Silver Bow County are listed in Table 5.

Administrative Agency/ Owner	Priority Zone 1	Priority Zone 2	Priority Zone 3	Priority Zone 4	Total WUI Zone
Private	71,333.18	49,157.50	31,946.12	17,851.21	170,288.01
USFS	26,378.79	35,271.90	34,669.55	39,484.39	135,804.63
BLM	6,896.11	9,949.23	8,714.81	6,248.97	31,809.12
FWP	2,543.92	3,626.73	3,870.17	2,125.85	12,166.67
State Trust Land	1,881.08	2,768.74	3,005.78	2,796.69	10,452.29
TOTAL	109,033.08	100,774.10	82,206.43	68,507.11	360,520.72

Table 5 – WUI Priority Protection Zone Area by Ownership

Risk Assessment

To assess the risk of wildfire exposure in the County's WUI it was necessary to first generate a model that assesses the present fire hazard and then correlate the exposure this hazard presents to the WUI. The defined Butte-Silver Bow County WUI priority zones and three existing geographic information system (GIS) layers/data in addition to information provided by local stakeholders, universities, and federal and state land management agencies were used to complete the modeling process.

Fire Hazard

To estimate the risk to values within the Butte-Silver Bow County WUI in the event of wildfire, an examination of fire hazard at a landscape level is necessary. In the absence of previous fire hazard study specific to Butte-Silver Bow County, Fox Logic, with direction from the stakeholders, selected two previously completed modeling projects to build a model of fire hazard across the County. Input data and maps for the model came from the Ignition Probability Model, Fire Behavior Fuels Models, and FRCC model provided by the Wildlife Spatial Analysis Lab (WSAL) at the University of Montana.

Hazard Defined…

Function: noun
Etymology: Middle English, from Middle French hasard, from Arabic az-zahr the die
1 : a game of chance like craps played with two dice
2 : a source of danger
3 a : CHANCE, RISK b : a chance event : ACCIDENT
4 obsolete : STAKE 3a
5 : a golf-course obstacle
- at hazard : at stake

Source: Merriam-Webster Dictionary

- Fire Behavior Fuels Modeling

Three primary environmental factors influence fire behavior: fuel, weather, and topography. To best approximate these factors, fire behavior fuels models developed by Rothermel (1972) and Albini (1976), estimated and mapped by the FireRisk 2000 project at WSAL (2000) for the USFS (Figure 6), were incorporated into the fire risk/impact model. These fire

behavior fuels models are intended to estimate total theoretical fuel load, fire rate of spread (ROS), and flame length present during a peak burning period of the fire season.

The fuels models (30m grid) are described by the most common fire-carrying fuel type (grass, brush, timber litter, or slash), loading and surface area-to-volume ratio by size class and component, fuelbed depth, and moisture of extinction. Each of the total 13 fuels models has a specific estimated total fuel load (< 3-inch dead and live, ton/acre), ROS, and characteristic flame length attributable to the conditions, including inferred weather and topography of an average site in the wildland. Numerically denoted from 1 to 13, fuels models are described by two distinct orientations with two fuel groups in each orientation: vertically, as in grasses and shrubs, and horizontally, as in timber, litter, and slash (Anderson 1982). Not every fuel model will be represented within a given area of the landscape.

Fire behavior fuels models in the FireRisk 2000 dataset were assigned on the basis of covertype, and/or potential vegetation type (PVT), and/or size class, and/or canopy by WSAL. Fire management personnel throughout the Northern Region helped develop the model assignment rules for the FireRisk 2000 fire behavior fuels models. A complete description of the fire behavior fuels models estimation and rule assignment can be found in the FireRisk 2000 readme.txt file that accompanies the data set (WSAL 2000).

Describing Fire and Fuels

Fuel Model	CWPP Rank	Vegetation Types	Fire Behavior	Fuels	Rate of Spread (ft/hr)	Flame Length (ft)
1	5	Perennial grasslands, annual grasslands, savannahs, grass-tundra, grass-shrub with < 1/3 shrub or timber	Rapidly-moving	Cured fine, porous herbaceous: 0.5 - 0.9 tons surface fuel /acre; 0.5 - 2 ft depth	5,148	4
2	2	Shrub, pine with <2/3 shrub or timber cover	Moderate spread in herbaceous with added intensity from litter/wood and production of firebrands	Fine herbaceous surface cured or dead, litter, dead stem or limb wood; 1 - 4 tones/acre;0.5 - 2 ft depth	2,310	6
5	3	Moist or cool shrub types (alder), forest shrub, regeneration shrub fields after fire or harvest	Slow-moving and low moderate intensity	Green foliage with w/o litter; 3 - 5 tons/acre; 1 - 3 ft depth	1,188	4
8	4	Closed-canopy short-needle conifer types, closed-canopy	Typically slow moving with low intensities; can move rapidly with high intensity with low fuel moistures and hot/dry/windy conditions	Usually low- to moderately-flammable foliage with litter or scattered vegetation understory; 4 - 6 tons/acre surface fuels; 0.1 - 0.5 foot depth	106	1
10	1	Any forest type with >3" dead, downed woody fuels	High fire intensity with low fuel-moisture and fast moving with wind	Dead, downed > 3" woody fuels and litter; 10 to 14 tons/acre of total surface fuel < 3"; 0.5 - 2-foot depth; 10 to - 14 tons per acre total fuel load < 3"; 0.5 to 2-foot depth	521	4.8

Source: Anderson 1982

The fuels models present in Butte-Silver Bow County as illustrated in Figure 6 are 1, 2, 5, 8, and 10. Each fuels model was ranked, for GIS analysis, based on a weighting value derived from the addition of estimated total fuel load, flame length and ROS provided in *Aids to Determining Fuels Models for Estimating Fire Behavior* (Anderson 1982). This simple fuels

behavior model ranking method resulted in the following prioritization (from highest to lowest fire behavior fuels ranking): model 10, 2, 5, 8, and 1.

- Ignition Probability Modeling

A fire ignition probability model GIS layer also developed by the WSAL team for the USFS Region One Cohesive Strategy Team, using USFS fire ignition data, the same data set used in the Fire Statistics section of the CWPP, was selected to portray countywide fire ignition probability based on the predicted incidence (i.e. # fires/1,000 acres /10 years) (Figure 7).

This "…layer is based on an analysis of natural and human caused fire starts from 1981 through 2000. Fire start densities per 1 km cell were calculated using a point interpolate function based on the fire start data. A fire ignition probability layer was then created based on a natural break(s) analysis of the fire start densities. Four fire ignition probability classes were mapped: 1 (low), 2 (mod), 3 (high), and 4 (very high). This layer was based on a fire start point coverage assembled from multiple sources but some data gaps are possible during the 20-year period covered. Each 1 km cell has been assigned relative weighting of probable fire ignition: 1 (low), 2 (mod), 3 (high), and 4 (very high)" (CST 2002).

- Fire Regime Condition Class Modeling

Wildfire in Butte-Silver Bow County may also have acute negative impact on the natural wildland ecosystem. In an effort to account for this impact, a FRCC model has been included as part of this risk assessment. The WSAL FireRisk 2000 data set includes a FRCC model that estimates the deviation of wildland from its natural fire regime (Figure 8).

Fire Condition Class is based on degree of departure between predicted current and historical fire regimes developed by Mr. Colin Hardy and Mr. Steve Barrett respectively. Mr. Jeff Jones and Doug Berglund of the USFS assigned rules for determining degree of current departure from natural fire regime. It is important to note that the ruleset has not been peer-reviewed and is considered a draft model. Please see the complete description of the FRCC estimations and rule assignment can be found in the FireRisk 2000 readme.txt file that accompanies the data set (WSAL 2000).

The areas estimated as FRCC 3 are of particular concern and have been theoretically fire-deprived for three or more fire cycles from their natural fire return interval. The risk of extensive ecological damage to key ecosystem components during a natural fire event in these areas would be high as vegetation composition, structure, and diversity have been significantly altered by fire exclusion. Consequently, these lands are subject to the greatest risk of ecological collapse as a result of uncontrolled catastrophic wildfire.

Consequences of a Changed Fire Regime

Fire Regime Condition Class	Description	Species Composition and Structure	Potential Risks
Condition Class 1	Within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	Species composition and structure are functioning within their natural (historical) range at both patch and landscape scales.	Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuel characteristics. Composition and structure of vegetation and fuels are similar to the natural (historical) regime.
Condition Class 2	Moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	Species composition and structure have been moderately altered from their historical range at patch and landscape scales. For example: Grasslands – Moderate encroachment of shrubs and trees and/or invasive exotic species. Shrublands – Moderate encroachment of trees, increased shrubs, or invasive exotic species. Forestland/Woodland – Moderate increases in density, encroachment of shade tolerant tree species, or moderate loss of shade intolerant tree species caused by fire exclusion, logging, or exotic insects or disease. Replacement of surface shrub/grass with woody fuels and litter.	Risk of loss of key ecosystem components (e.g. native species, large trees, and soil) are low Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe). Composition and structure of vegetation and fuel are moderately altered. Uncharacteristic conditions range from low to moderate.
Condition Class 3	High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	Fire behavior, effects, and other associated disturbances are highly departed (more or less severe). Composition and structure of vegetation and fuel are highly altered. Uncharacteristic conditions range from moderate to high. Risk of loss of key ecosystem components are high.

Source: USFS Fire Regime Condition Class Definition

The FRCC 2 rated areas have missed more than one fire cycle but are not as vulnerable to the impacts of a natural wildfire. FRCC 1 areas are those at or near their natural fire regime. For the purpose of the CWPP fire risk/WUI impact model, wildland in FRCC 3 category within the

WUI will receive a rating of high risk of impact from wildfire, FRCC 2 medium risk, and FRCC 1 low risk for later mapping.

Fire Risk

The WUI risk rating system used three weighted GIS layers (fire hazard model) overlaid on the WUI priority protection zone map in order to produce a combined fire risk/WUI impact model. Four model data inputs were used: fire behavior fuels models, the ignition probability model, the FRCC, and WUI priority protection zone data (Table 5). Data from each of the four input sets was weighted and passed through a prioritization matrix that generated a score from 4 to 16 (Table 6). The final fire risk/WUI impact map generated from the weighting and scoring is included as Figure 9. Three smaller scale fire risk/WUI impact maps of Butte-Silver Bow County, with a land survey overlay, are also included as Figures 10 to 12.

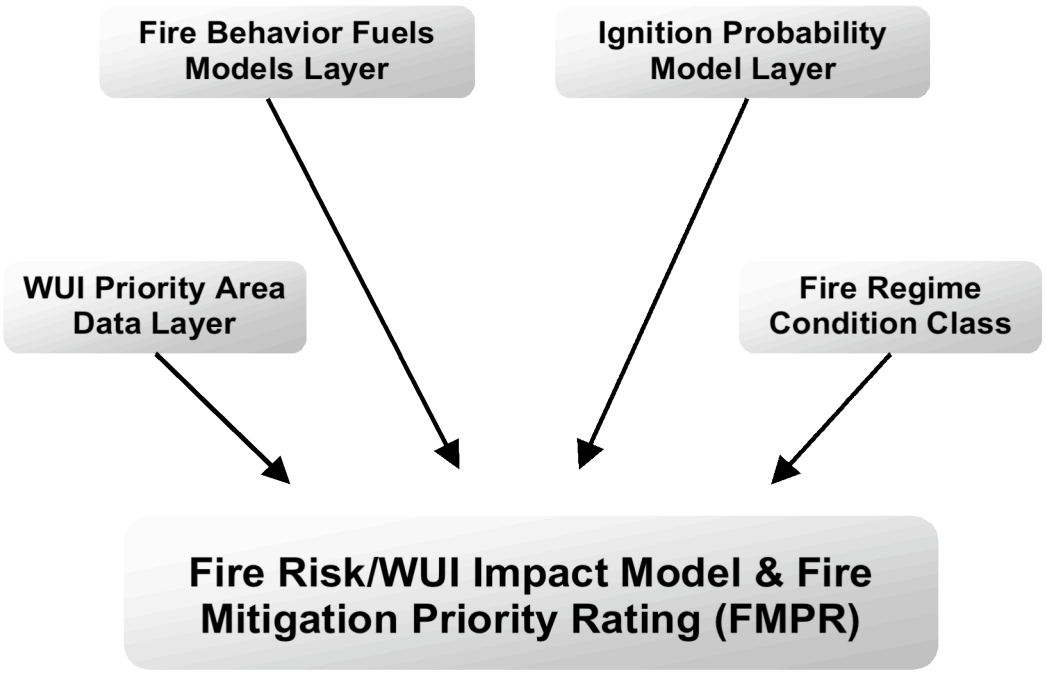


Table 6 – Mitigation Prioritization Rating System Input

To allow prioritization of land management activity it is necessary to develop an association between fire risk/WUI impact model and mitigation need. To this end, a fire mitigation priority-rating (FMPR) letter scoring scale is linearly related to the fire probability/WUI impact model and is determined as follows: *very high* (risk score >13), *high* (11 to 13), *medium* (8 to 10), or *low* (<8). Second, risk scoring developed in the first step was spatially separated and mapped into the four WUI protection zones derived in the WUI Prioritization Section of this document (Figure 8).

Site- or project-specific FMPR may be generated to further tailor mitigation activity planning and/or project implementation and prioritization. Two methods can be used to determine an on-site FMPR. Method one is used to generate an on-site FMPR through professional estimation of FRCC and Fire Behavior Fuel, then the use of the Ignition Probability Model (Figure 6), and determination of the WUI Priority Zone (Figure 5). A FMPR score may then be tabulated using the matrix in Table 7. A second method of FMPR estimation uses the maps contained in this Plan: pinpoint the site in Figures 9 to 12 and the prioritization equals the FMPR. A fictitious area is scored and summed below using the prioritization matrix.

To further tailor the fire risk rating the MT MT DNRC Fire Risk Rating scorecard (MT DNRC 1993) for existing wildland residential developments is included in Appendix C. The MT MT DNRC Fire Risk Rating has been used in the inventory of many western Montana subdivisions and is used to derive a fire risk/priority rating. Completion of the MT MT DNRC risk rating may provide a more thorough understanding of specific area needs. The combination of site- or project-specific FMPR and MT MT DNRC Fire Risk Rating will provide useful information for allocating funding and establishing baseline conditions for project implementation and monitoring, but does not determine what mitigation scheme or activity will be needed to reduce the fire risk.

FMPR Example

Data/Model Input	*Rank*	*Weighting*
WUI Priority Protection Zone	#2	3
Fire Behavior Fuels Model	#5	4
Fire Regime Condition Class	#2	2
Ignition Probability	Medium	2

FMPR Score = 11
or High Mitigation Priority

WUI Priority Zone 4 (Low)																
Fire Behavior Fuel Model Prioritization		Model 1			Model 8			Model 5			Model 2			Model 10		
FRCC Rating		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Ignition Probability	Low	4	5	6	5	6	7	6	7	8	7	8	9	8	9	10
	Moderate	5	6	7	6	7	8	7	8	9	8	9	10	9	10	11
	High	6	7	8	7	8	9	8	9	10	9	10	11	10	11	12
	Very High	7	8	9	8	9	10	9	10	11	10	11	12	11	12	13
WUI Priority Zone 3 (Moderate)																
Fire Behavior Fuel Model Prioritization		Model 1			Model 8			Model 5			Model 2			Model 10		
FRCC Rating		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Ignition Probability	Low	5	6	7	6	7	8	7	8	9	8	9	10	9	10	11
	Moderate	6	7	8	7	8	9	8	9	10	9	10	11	10	11	12
	High	7	8	9	8	9	10	9	10	11	10	11	12	11	12	13
	Very High	8	9	10	9	10	11	10	11	12	11	12	13	12	13	14
WUI Priority Zone 2 (High)																
Fire Behavior Fuel Model Prioritization		Model 1			Model 8			Model 5			Model 2			Model 10		
FRCC Rating		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Ignition Probability	Low	6	7	8	7	8	9	8	9	10	9	10	11	10	11	12
	Moderate	7	8	9	8	9	10	9	10	11	10	11	12	11	12	13
	High	8	9	10	9	10	11	10	11	12	11	12	13	12	13	14
	Very High	9	10	11	10	11	12	11	12	13	12	13	14	13	14	15
WUI Priority Zone 1 (Very-High)																
Fire Behavior Fuel Model Prioritization		Model 1			Model 8			Model 5			Model 2			Model 10		
FRCC Rating		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Ignition Probability	Low	7	8	9	8	9	10	9	10	11	10	11	12	11	12	13
	Moderate	8	9	10	9	10	11	10	11	12	11	12	13	12	13	14
	High	9	10	11	10	11	12	11	12	13	12	13	14	13	14	15
	Very High	10	11	12	11	12	13	12	13	14	13	14	15	14	15	16

Low Priority Medium Priority High Priority Very High Priority

Table 7 – Fire Mitigation Prioritization Matrix

Priority WUI Area

Butte-Silver Bow County FMPR areas are broken into four levels of priority, there are an estimated 3,941.48 acres of very-high FMPR category area, 58,057.23 acres in high, 171,063.24 acres in medium, and 111,354.39 acres in low (Table 5). Of the six primary landowners the USFS has the largest number of very-high priority area, with 3,148.91 acres, and the largest number of total priority acres are estimated to fall under private ownership with 155,681.08 acres. Complete FMPR acreages by ownership in Table 8.

Unidentified areas inside the WUI priority assessment have resulted from data gaps in the ignition probability data layer. This missing data results in FMPR model gaps, though relatively insignificant, are illustrated by the difference between total WUI acres (Table 5) and number of priority rated acres (Table 8). Most land not assigned an ignition probability model score is thought to be agricultural land, rock, water, or ice.

Administration Agency / Owner	Very High Priority	High Priority	Medium Priority	Low Priority	TOTAL
	All Data in Acres				
Private	394.24	31,047.42	75,474.26	49,159.40	155,681.08
USFS	3,148.91	18,593.89	66,240.11	46,224.24	131,058.24
BLM	295.63	5,893.48	17,182.78	8,208.72	31,284.98
FWP	48.22	1,933.02	6,834.75	3,329.37	12,097.14
State	54.48	589.42	5,331.34	4,432.66	10,353.42
TOTAL	3,941.48	58,057.23	171,063.24	111,354.39	344,416.34

Table 8 – Fire Mitigation Priority-Rating Acreages

Stakeholder-Identified Areas

In addition to the spatial ratings generated by the FMPR stakeholders have identified areas of high local that they believe deserve special attention. There is considerable concern by residents and local fire authorities that the fire hazard in the Basin Creek, south Butte, East Ridge, and Big Hole areas is considerable and warrants high priority for fuel hazard reduction. These forested WUI areas will ultimately develop further increases in fire hazard due to forest mortality and rising dead woody fuel loading. Fire hazard and risk reduction measures should be introduced in a timely manner. The potential fire mitigation need and desire associated with these areas may not be adequately represented in the FMPR model.

PLANNED AND COMPLETED MITIGATION ACTIVITIES

Recognizing the presence of WUI hazard, wildfire risk issues and a need for wildfire preplanning, in 1994 MT MT DNRC contracted Mr. Jon P. Agner of Missoula, Montana to complete an inventory of wildfire risk conditions at the subdivision level within west-central Montana. In this assessment unfortunately only one Butte-Silver Bow County WUI subdivision, Fairmont, was inspected using risk/priority ratings based the *MT MT DNRC Fire Risk Rating* (MT DNRC 1993). The following ten factors were inspected during the risk/priority rating:

- Total number of houses
- Total number of fire-resistant roofs
- Predominant aspect
- Slope of inhabited area
- History of fire occurrence
- Number of road standard egress/ingress routes
- Percentage of homes employing fire-safe landscaping techniques
- Availability of water
- Distance from responding fire protection agency

The Fairmont subdivision ranked at a high risk to wildfire and a high priority for infrastructure/ condition modification and/or improvement (Table 9). The average of all 34 Western Montana subdivisions inventoried in the MT MT DNRC *Fire Risk Rating (1994*) was very high risk/priority. Based on this average, it is estimated that the WUI fire preparedness level remains in need of improvement and un-inventoried subdivisions in the County are likely near the average very high risk/priority for wildfire preparedness improvement seen throughout the rest of western Montana.

Subdivision	Risk/Priority Rating (Points)
Fairmont	137

<101 Low
102-124 Moderate
125-139 High
140-158 Very High
>159 Extreme

(Source – MT DNRC 1994)

Table 9 – County Subdivision Wildfire Risk/Priority Rating

In the development of the *Butte-Silver Bow City/County, Montana – Town of Walkerville, Montana – Hazard Mitigation Plan* (Big Sky Hazard Management 2004*),* a survey of possible hazards identified “wildfire” as the number five priority out of 18 hazards listed in the plan. The County has been and will continue to be proactive in its effort to reduce the size and frequency of fires in its WUI area. Specifically, fire hazard reduction in the WUI will be bolstered by the recent creation of a Urban Interface Specialist position to better educate private landowners

and help owners apply for Federal and state cost share funding for private projects on their interface holdings.

Federal agencies have also been working to increase awareness of fire risk/hazard issues and promote fire hazard reduction in the County. As an example, County Community outreach and awareness education was initiated by the BLM in May 2004 with a Wildfire Awareness Week campaign. The BLM and Butte-Silver Bow Fire Protection Association presented Firewise™ principles and landscaping techniques to the general public during the campaign. Radio and television information spots showcasing “Defensible Space” signs (donated by Mr. Jim Lynch, a local State Farm Insurance agent) were also featured as part of the week.

Local, state, and federal land management agencies have also been endeavoring to actively manage land in their administration areas to reduce hazardous fuels condition around the WUI. For example, the USFS is planning to treat 2,600 acres in the Roosevelt Drive/Basin Municipal Watershed, though the project’s Environmental Impact Statement (EIS) it is currently being appealed and timely application of the project is currently slowed by litigation.

IMPLEMENTATION, MONITORING, AND REVIEW

This section outlines recommendations compiled by Fox Logic for the implementation, monitoring, and review of mitigation activities outlined in the CWPP. These recommendations are intended to provide a starting point for the County to build upon. Revisions in the Plan should accommodate changing wildland conditions, new technologies, and evolving priorities within the County. Implementation of on-ground action should be strategic and completed using the FMPR system with one or many of the prescribed activities in the following section of the CWPP.

CWPP management direction will be applied through a dual process of plan implementation and monitoring. Implementation is the responsibility of local government through a designated WUI coordinator, to be developed, to employ the CWPP strategies on priority land areas. The County as a whole has an ongoing responsibility in monitoring how effectively the government is implementing the plan and whether the stated management intent is being achieved. Through ongoing feedback, the implementation of the Plan can be adapted to increase its overall effectiveness.

Activities prescribed in the CWPP will be reflected in resource management, development, and fire mitigation activities as soon as possible. The term of the CWPP is 10 years, with minor review yearly, and a major review beginning at year 9 in preparation for the next plan.

Implementation action will be guided by a time schedule that addresses the highest priority and largest risk areas first, while at the same time (but on a lower priority) treating moderate risk areas over the long term (Table 10). Low-risk areas will receive low treatment priority unless specifically identifies by federal or state agencies or the County WUI Coordinator as requiring treatment.

Implementation

Successfully mitigating WUI wildfire risk and improving structure fire survivability/defense in Butte-Silver Bow County rests directly on the effective management of the plan and its implementation. The Fire and Wildland-Urban Interface Risk section identified areas where at-risk values are and respective mitigation priority ratings. Strategies discussed in this section will detail the types of activities that can be implemented to mitigate the risk of negative wildfire impact on WUI structures and values. Implementation of the CWPP risk reduction strategy can occur through a number of processes:

- Incremental mitigation activities implemented as specific CWPP projects
- More detailed plans, such as watershed wildfire plans, subdivision wildfire plans
- Subdivision development requirements
- County wildfire safety codes

Further higher detail planning will be necessary before on-ground mitigation action can occur.

Wildland-Urban Interface Fire Hazard Mitigation

WUI protection and fire hazard reduction may be accomplished using different approaches that will be implemented in mitigation activity planning. Six general strategies to hazard reduction and risk mitigation are ranked from high to low priority (Table 10). The highest priority is assigned to strategies that result in the greatest reduction of WUI fire hazard with the least amount of time.

Strategy	Priority	Activity Description
Fuels Management	1	• Continue/complete current mitigation activities. Initial focus will be on defensible space then removal of commercial value wood, pre-commercial thinning, prescribed burning, stream restoration, and weed control that promote the reduction of fire hazard. • Support new hazardous fuels treatment projects within the wildland urban interface and promote Firewise™ principles. • Encourage private landowners and agencies to address forest health issues and mitigate fire risk. • Encourage the development of subdivision level wildfire assessment and planning.
Education/ Prevention	2	• Promote wildfire prevention education and training in the form of public school instruction and/or media outreach programs. • Expand County outreach or extension programs developed by federal and state agencies, or Local Government. • Design/conduct WUI residence hazard assessments in coordination with federal and state outreach programs. • Promote subdivision wildfire evacuation planning.
Planning	3	• Improve road access in constrained areas of the WUI. • Install/improve dry hydrants in identified priority locations. • Encourage Fuels Treatment Guidelines for new subdivisions. • Adopt and enforce the Montana Model Subdivision Regulations, Special Requirements for Proposed Subdivisions in Areas of High Wildfire Risk for new subdivisions. • Develop a wildland dispatch plan to compliment the municipal dispatch plan.
Development	4	• Establish guidelines possibly in the form of minimum codes for new structures and subdivision areas to ensure fire safe characteristics (such as the NFPA 1144 standard) and/or implement FireWise standards. • Assess WUI residences as part of a real estate transfer program.
Training	5	• Improve cross-training of firefighters who suppress forest and structure fires.
Inter-agency Cooperation	6	• Review, improve and revise mutual aid agreements between VFDs, city FDs, state, federal, and private firefighting resources where necessary.

Table 10 – Implementation Strategy

Fuels management, a direct strategy, is assigned the highest priority. The five other strategies, indirect mitigation strategies, will lead to changes in policy and attitudes and ultimately result in

the reduction of wildfire hazard and risk exposure. Table 10 also describes activities that are recommended be completed under each of the mitigation strategies.

Fuels mitigation activities are complex and numerous and should be tailored to terrain, habitat type and condition, ecology, or social situation. The following is a non-exhaustive list of activities that may be employed for direct fuels mitigation:

- Commercial and non-commercial timber thinning (including selective and group thinning)
- Pruning
- Under burning
- Creating shaded fuel breaks
- Mulching and chipping
- Grazing
- Brush/grass mowing
- Weed treatment

Many mechanical tools are available to complete the above listed activities. Detailed information on these tools can be found in the *Understory Biomass Reduction Methods and Equipment Catalog* (Windell and Bradshaw 2000). Combinations of activities, techniques, and tools used under the appropriate conditions as guided by the CWPP will reduce the identified fire hazard and risk exposure in an ecologically, environmentally, and socially responsible manner. Where possible, fiber wastes created by mitigation activity should be used for biofuel.

Source: Partners in Protection

Wildland-Urban Interface Structure Fire-Risk Reduction

Much of the previous section addressed the mitigation of wildfire risk and/or impact of wildfire on the greater landscape beyond the individual structures in the WUI. This section builds on the landscape level mitigation strategy by making wildfire risk reduction recommendations that

can be applied to individual structures and the area directly surrounding those structures. In the event of a major WUI fire involving numerous buildings, firefighters will likely prioritize (triage) the protection of homes and buildings based on ease of protection. Many of the strategies mentioned previously may also be used to reduce the risk of a potential loss of structure or to increase firefighter safety while engaging fire in the interface.

A series of educational bulletins that include landowner outreach and risk reduction checklists for homes/structures and yards have been included in Appendix C. The items included in the appendix as well as many additional mitigation, emergency preparedness resources, and structural ignition reduction tactics and web links to those resources may be found on the FireWise™ website (www.Firewise.org/) and the Partners in Protection: Fire Smart™ website (www.Firesmart.org/). These resources are tailored guidelines that are based on firefighter observations, scientific analysis, and actual conditions that have allowed structures and communities to be successfully protected in the face of wildfire. Factors that improve structural survivability and defensibility can include, but are not limited to, FireWise™ concepts that help modify interface forest fuels and fuels configuration, promote the use of building material products and techniques that inhibit fire ignition and/or flammability, and provide educational materials and techniques for education of interface landowners.

Vegetation Flammability

Vegetation research has shown that using the following tree species to make landscaping, forest thinning, and species conversion decisions will lead to less flammable interface forest conditions (Partners in Protection 2003).

Tree Species	Flammability
Aspen	Very Low
Cottonwood*	Very Low
Maple	Very Low
Willow species*	Very Low
Birch	Low
Western larch	Low
Ponderosa pine	Medium
White Pine	Medium
Colorado Blue Spruce*	High
Douglas-fir	High
Engelmann Spruce	High
Grand fir	High
Lodgepole pine	High
Mountain hemlock	High
Sub-alpine fir	High
Western red cedar	High
Western Juniper*	Very High

** Added by Fox Logic*

Aimed at improving structural survivability, and defense, and reducing structural ignition in the face of imminent wildfire exposure, structural risk reduction tactics described in Appendix C items utilize all six wildfire mitigation strategies prioritized in Table 10.

Specific minimum structure ignition reduction measures that the County WUI Coordinator and fire authorities should recommend for established WUI homes and out buildings include the creation of defensible space areas extending 30 feet from all structures that are clear of debris, watered, mowed, and landscaped with lower flammability vegetation that is pruned and manicured. Further recommendations should include fire-resistant decks, porches, and fences, and fire-resistant roof and exterior construction as outlined in Appendix C: The FireWise™ Home.

Fox Logic suggests that the County adopt such a system of fire pre-planning, outreach, and certification for structures and yards in the WUI. FireWise™ is only one example of how a structure-fire risk reduction system can be put together. Such a program could be introduced to property owners by the County and used in conjunction with other fire risk reduction programs such as the National Fire Prevention Association 1144 *Standard For Protection of Life and Property From Wildfire*. As FireWise™ is currently established as a national system of WUI homeowner outreach, education, guidance, and certification in the United States, Fox Logic recommends that as a minimum Butte-Silver Bow County adopt the guidance principles and techniques it prescribes in an effort to become a FireWise™ certified community. Certification effort can be employed simultaneously with mitigation activities in the WUI areas identified as very-high FMPR.

Stakeholder-Identified Priorities

Stakeholders made many specific suggestions to improve suppression capability. These ideas included the installation of municipal or dry hydrants in the Basin Creek area and increasing inadequate bridge capacities, for safe fire truck access, at many locations throughout the County.

A policy suggestion worth further mention was for a wildland dispatch plan, to compliment the municipal dispatch plan already in place, be developed to better serve the WUI fire protection needs of the County.

Timeline

CWPP mitigation actions will be implemented according to a time schedule addressing very high- and high-risk areas, including the Rader Creek and Cedar Creek subdivision areas, first during the period beginning 2005 and ending 2015. It is anticipated that 10 percent of the highest risk/priority land area can be treated by the end of the ten-year implementation period (Table 11).

The second highest implementation priority is medium-risk areas. Mitigation of these areas will be the focus of attention during the period beginning in 2008 and ending 2015 with the expectation that a 5 percent of the identified at risk land can be treated. Remaining, risk areas identified are the third priority and will be treated during the period beginning 2010 and ending 2015. It is anticipated that long-term maintenance of previously treated areas and treatment of lowest priority areas will be negligible during the first iteration of the CWPP. Activity during the 10-year life of the Plan will be guided by review and recommendations of the by the Monitoring Committee.

CWPP-authorized fuels mitigation action by state and Federal land management agencies on public land to reduce fuel hazard will place considerable justification on the FMPR system in determining priority land areas. Initially, highest priority will be assigned to very-high and high FMPR area designation projects that meet developed prioritization criteria and grant objectives and fall within the highest FMPR category. Federal and state agency activity planning on public land will meet Montana Environmental Planning Act (MEPA) and National Environmental Planning Act (NEPA) policy, respectively, including public announcements and scoping documents the agencies use to develop mitigation projects.

Fire mitigation projects on private land follow a similar system of prioritization as outlined for state and federal projects. Private non-industrial forest WUI landowners who want to reduce

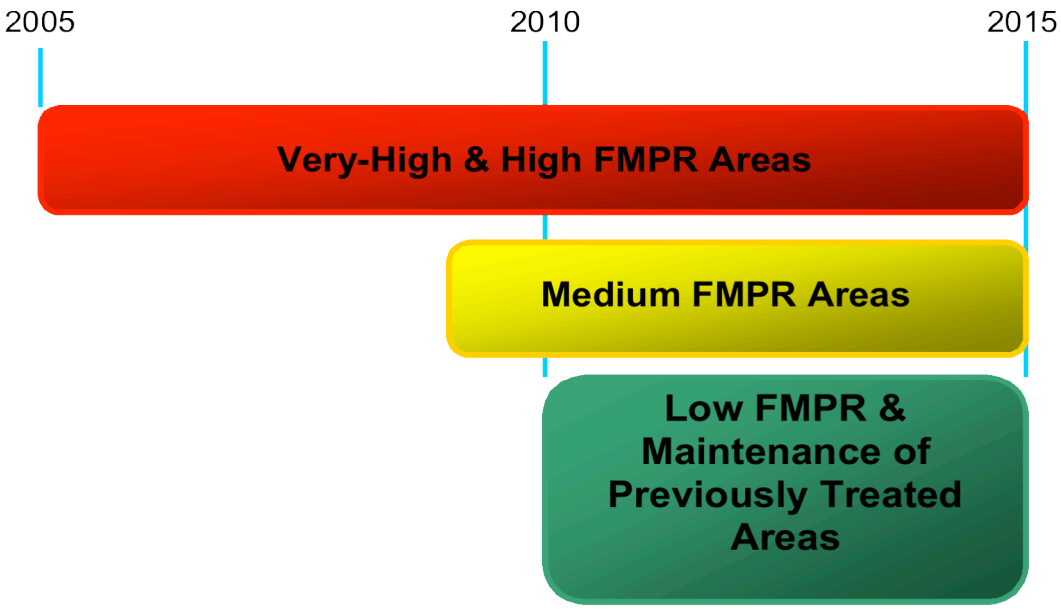


Table 11 – Hazard Mitigation Timeline

the risk of loss to wildfire are directed to work with their WUI Coordinator, MT DNRC Extension Forester, or approved private contractor to generate a site FMPR score, or equivalent fire risk rating, for their proposed project area and develop a fuels mitigation plan. The County WUI Coordinator, or equivalent designate, will use site-specific FMPR scores on private properties to develop an unbiased ranking of site fire risk for allocating assistance.

Hazard Reduction Treatment Costs

Financial analysis completed by the USFS for comprehensive restoration of forested areas in western Montana indicated that an average cost of treatment, for returning sustainable forest structure while diminishing crown fire risk was expected to be $287.00/acre (Fiedler et. al 2004). The analysis derived the cost estimate based on removing late-successional species and reducing density to promote seral species regeneration. The modeled analysis commonly required the cutting of medium- and larger-sized trees with commercial value. This value often covered much or all of the treatment cost. This analysis does not estimate the costs associated with completing hazard reduction in the WUI but the estimate should be representative of costs for WUI areas at further distance from structures.

Costs associated with treatment of areas within close proximity to structures can often be quite expensive. Each area presents unique challenges and costs can vary greatly. Fuels reduction projects recently completed with the assistance of the Headwaters RC&D District, Inc. have averaged approximately $1,667.00/acre.

Total very-high, high-, and medium- FMPR area is 233,062 acres. To estimate total cost of treatment for all these acres it was first necessary to determine a rough estimate of the total acres that could be treated in close proximity of structures. To complete this task the total number of WUI houses (594)(MT NRIS 2005) was arbitrarily estimated to have 5 acres of treatable forest immediately around the structure results in a total of 2,970 acres. It is assumed that not all houses in the WUI will have five acres of treatable-hazardous forest but it may be assumed that some homes may have 20 acres or more requiring treatment. The remaining land area of elevated mitigation priority, beyond structures, is 230,092 acres.

To estimate WUI treatment cost it was necessary to use both the USFS and the local Headwaters RC&D assisted project cost estimates. The total area that may be treated is 233,062 acres of which it is estimated that 2,970 acres are near structures and 230,092 acres occur at farther distance from structures. Multiplying the acreages by their appropriate cost estimate results in: $4,950,990 and $66,036,404. The total estimated WUI treatment cost is $70,987,394.

Higher Detail Plans

As part of implementation, it will likely be necessary to refine the broad, strategic guidance and risk ratings in the CWPP and develop specific project level plans. One such plan, the TCFWG *Regional Community Fire Protection Plan,* has already been written. Some of these detailed wildfire protection and project plans may include watershed level plans, subdivision plans, other managed area wildfire plans, and future local development plans to address area-specific fire issues.

In all cases, it is expected that the detailed planning initiatives and the resulting products will be guided by and be consistent with the intent of the CWPP. Where more detailed planning reveals new information, a minor revision or amendment to the CWPP may be warranted, in accordance with the criteria outlined in the Minor Revision section that follows.

Roles and Responsibilities

A number of different players are involved in implementation and monitoring of the CWPP. The roles and responsibilities of the various participants in the process are as follows:

Butte Fire Protection Association

The Butte Fire Protection Association (BFPA) includes managers from resource management agencies, disaster and DES coordinator, volunteer fire department chiefs, the fire warden, and county sheriff. The BFPA provides overall coordination, implementation, and strategic fire planning throughout Butte-Silver Bow County. The BFPA will:

- Coordinate implementation of the Butte-Silver Bow County CWPP;
- Monitor implementation progress and compliance by agencies and private landowners;
- Interpret plan management priorities and strategies and resolve issues where necessary;

- Oversee the preparation of an annual monitoring report on plan implementation;
- Establish and coordinate the activities of a Monitoring Committee;
- Review recommendations from the Monitoring Committee on proposed plan amendments and provide advice on those amendments to local Government;
- Provide the CWPP document to federal and state resource agency staff, stakeholders, American Indian Tribes, and interested public;
- Advise local government of specific problems regarding plan implementation; and
- Coordinate plan review.

Local Government

The County Commissioners will be kept informed about the implementation of the CWPP and are encouraged to participate in the implementation, ongoing monitoring, and review of the plan.

Local governments are encouraged to inform the BFPA and agencies of settlement planning initiatives that may have implications for implementing the CWPP direction.

Federal and State Agencies

Government agencies are the primary vehicles for the implementation of the CWPP through the ongoing delivery of government programs, policies and initiatives as well as agency application of prescribed fire mitigation activities on public land. The relevant agencies will:

- Carry out responsibilities under the plan;
- Prepare a Tactical Plan detailing tasks arising from CWPP objectives and strategies, including defining priorities for implementation and more detailed planning;
- Provide the CWPP document to resource agency staff, stakeholders, American Indian Tribes, and interested public;
- Advise the BFPA on aspects of plan interpretation and implementation;
- Prepare summaries for the BFPA annual monitoring report;
- Initiate, review and/or provide technical recommendations on proposed revisions and amendments to the plan.

CWPP Monitoring Committee

The role of the CWPP Monitoring Committee, assembled by the BFPA, is to monitor resource management and development activities to assess compliance with, and effectiveness of, activities to meet the intent of the Butte-Silver Bow County CWPP. The Committee will concern itself with making wildfire mitigation and plan monitoring decisions.

The membership of the Committee is intended to be inclusive and to reflect the diversity of the stakeholders that developed the CWPP.

One of the first tasks of the members of the Monitoring Committee will be to develop a Terms of Reference and Ground Rules. The range of activities of the Committee could include the following:

- To review and provide input to an annual monitoring report;
- To bring any concerns and new information to the attention of the BFPA;
- To provide advice to agencies on plan interpretation and implementation upon request of the BFPA or individual agencies;
- To review and provide recommendations on proposed plan amendments, based on monitoring and implementation reports; and
- To provide community liaison concerning plan implementation and monitoring through the County WUI Coordinator.

Adequate funding may be available and provided through the NFP or other applicable grant sources to support participation in and activities of the Monitoring Committee.

Public

It is recognized that members of the public, in general, are important contributors to the effective implementation and monitoring of the CWPP in partnership with the WUI Coordinator, local government, and the different government agencies. The nature and level of public involvement in more detailed planning will be determined in response to emerging issues, stakeholder interests, and agency resources.

Monitoring

The monitoring phase of the CWPP involves ongoing assessment of how well the primary purpose of the CWPP is being implemented. The public, including the CWPP Monitoring Committee, has an important role to play in monitoring and providing feedback for the CWPP.

There are two aspects to plan monitoring:

1) An assessment of CWPP implementation through agency projects and programs; and

2) The effectiveness of plan implementation in achieving the management intent of the plan. If the desired outcomes of the CWPP are not being achieved, it may be necessary to consider revisions to the plan.

Section 102(g)(5) of the HFRA directs the USFS and BLM to “establish a collaborative multi-party monitoring, evaluation, and accountability process in order to assess the positive or negative ecological and social effects of authorized hazardous fuel reduction projects…” It is recommended that the BFPA Monitoring Committee participate in this multiparty monitoring effort.

Adaptive Management

The risk assessment, mitigation prioritization, and implementation plan in the Butte-Silver Bow County CWPP has been developed using the best information and knowledge available at this time. At the same time, there is inevitably a level of uncertainty in the ultimate effectiveness of management recommendations. Therefore, the CWPP endorses a process of adaptive management, in which implemented activities are monitored for effectiveness and changes are

enacted when and where required. The use of an adaptive management monitoring strategy will allow continual improvement of management policies and practices. By monitoring key response indicators over time and incorporating new information and knowledge, the BFPA, local government, and agencies will be able to analyze the outcome of their fire mitigation activity in light of the original CWPP intent and incorporate those results into future planning and approach to best practices in the WUI.

Annual Monitoring Report

Accountability to the plan is described in an Annual Monitoring Report, in which individual state and federal agencies and the WUI Coordinator report on implementation progress and the status of completion of projects or actions identified in the CWPP Implementation section. The Report also summarizes, through the evaluation of performance indicators, the achievement of expected outcomes for the CWPP.

The BFPA Monitoring Committee is responsible for preparing the Annual Monitoring Report. Those agencies and the WUI Coordinator responsible for implementing the CWPP objectives contribute annual reports on their progress of CWPP projects and activities.

The Annual Monitoring Report will be presented to the BFPA for review at an annual meeting to ensure that projects and programs are being implemented in accordance with the management direction and intent of the CWPP. As part of the review process, the Monitoring Committee may make recommendations on plan implementation and amendments. The BFPA will report back to the Monitoring Committee on how the recommendations of the Committee have been addressed.

Plan Amendments

Proposed revisions to the Plan as identified by the CWPP Monitoring Committee, agencies, or through more detailed planning will be identified in the Annual Monitoring Report. The BFPA will review and approve minor revisions to the plan, but major amendments will need to be approved by the three principal stakeholders.

Minor Revisions

The Monitoring Committee will make recommendations for minor revisions to the plan to the BFPA. With BFPA approval, minor revisions will documented in the annual monitoring report.

Examples of minor revisions include but are not limited to:

- Revised priorities for implementation;
- Refinements to objectives and strategies as suggested by more higher plans; and
- Plan changes required to conform to new laws and regulations.

Major Revisions

A major revision to the Plan will be referred to as an amendment. The following are considered amendments to the plan:

- Major revisions to intent or prescribed mitigation activities;
- Changes to the WUI definition and boundaries; or
- Changes to WUI value priority zone boundaries.

Although the CWPP Monitoring Committee does not have the mandate to make land use planning decisions, it can make recommendations for revisions or amendments to the plan. Any proposed amendments would be identified in the Annual Monitoring Report and at the annual Monitoring Committee meeting. The BFPA will decide when an amendment is required and will define and coordinate the process consistent with existing County regulations and policies.

Plan Review

The Butte-Silver Bow County CWPP is subject to a minor review yearly and a comprehensive review to commence in the 9th year of the plan and be completed by the 10th year. The BFPA may also consider annually whether or not a comprehensive review is warranted prior to the scheduled plan review.

Interpretation

From time to time, the public, local government, or agencies may become concerned about how the plan is being interpreted or about specific land and resource practices. In all instances of concern, the issues will be dealt with in a cooperative manner.

Interpretation of Priorities, Activities, and Strategies

The priorities, strategies, and activities in this CWPP should be interpreted at a broad or strategic level wherever possible. Where a concern is raised over the interpretation and/or implementation of priorities, strategies, or activities the concern should be addressed directly to the affected agency or the WUI Coordinator. The agency or WUI Coordinator will respond to the concern in writing, consulting with the BFPA for guidance where necessary.

If the matter is not satisfactorily resolved, the concern will be forwarded to the BFPA for resolution. The BFPA will determine if the decision is consistent with the intent of the CWPP. If it is consistent, no further action will be taken. If it is not, the agency or the WUI Coordinator will be directed to revise the decision to be consistent with the intent of the plan. The BFPA may consult with the Monitoring Committee on issues of plan interpretation.

Assistance Programs

Assistance is available from the federal and state government to non-industrial private landowners, landowner cooperatives, tribes, fire departments, state land managers, and state, city and county government. The purpose of these programs is to provide financial aid and equipment for the purpose of enhancing habitat, reducing wildfire risk, offering education, and aiding in future planning. (Table 12). Federal and state fuel reduction assistance and grant programs within Butte-Silver Bow County will prioritize mitigation opportunity on public and/or private lands based largely as identified by the FMPR as described in the Mapping/Risk Mitigation Priority Rating section of this Plan. Initially, highest priority will be assigned to very-high and high FMPR area projects that meet developed prioritization criteria and grant

objectives and fall within the highest FMPR category. Grant prioritization criteria will be further evaluated on an annual basis.

Note- Grant funding opportunities are not guaranteed and may vary from year to year.

Program	Description
Rural Fire Assistance	**Source:** National Fire Plan – Department of Interior **Description:** Provides funds to rural fire departments for wildfire fighting; also provides wildland fire equipment, training and/or prevention materials.
	More info: www.dnrc.state.mt.us/forestry/dnrcfiresite/volfire.htm#rfa
Fire Hazard Mitigation Assistance	**Source:** US Forest Service **Description:** USFS grants to state foresters through state and private funding, under authority of Cooperative Forestry Assistance Act. Intended to maintain and improve protection efficiency and effectiveness on non-federal lands, training, equipment, preparedness, prevention and education.
	More Info: www.fireplan.gov; Paula Rosenthal, MT DNRC
	Source: National Fire Plan **Description:** State fire mitigation assistance grant funds are targeted at state and local fire services, county emergency planning committees and private landowners. Assistance for projects to reduce hazard fuels in the WUI.
	More Info: www.fireplan.gov, www.fs.fed/us/r4 and www.dnrc.state.mt.us/forestry/dnrcfiresite
Volunteer Fire Department Assistance	**Source:** US Forest Service **Description:** State and private grants under the authority of Cooperative Forestry Assistance Act provided to state foresters for distribution to municipal and volunteer fire departments. Provides monetary and technical assistance in organizing, training, and purchasing equipment to enable them to effectively meet their structure and WUI protection responsibilities.
	More Info: www.fs.fed.us/fire/partners/vfa and www.dnrc.state.mt.us/forestry/dnrcfiresite/
Economic Action Program	**Source:** US Forest Service **Description:** A USFS, state and private program with involvement from local Forest Service offices to help identify economic development projects. Addresses long-term economic and social health of rural areas; assists the development of enterprises through diversified uses of forest products, marketing assistance, and utilization of hazardous fuel byproducts.
	More Info: www.fs.fed.us/r1-r4/spf/montana/
Forest Land Enhancement Program (FLEP)	**Source:** US Forest Service **Description:** USDA grants to private non-industrial landowners under the authority of the 2002 Farm Bill. FLEP purposes include: 1) Enhance the productivity of timber, fish and wildlife habitat, soil and water quality, wetland, recreational resources, and aesthetic values of forest land through landowner cost share assistance, and 2) Establish a coordinated, cooperative federal, state and local sustainable forestry program to establish, manage, maintain, enhance and restore forests on non-industrial private forest land.
	More info: www.usda.gov/farmbill

Table 12 – Assistance Opportunities

Program	Description
Federal Excess Property	**Source:** US Forest Service **Description:** Provides assistance to state, county and local governments by providing excess federal property (equipment, supplies, tools) for wildland and rural community fire response.
	More info: www.fs.fed.us/fire/partners/fepp/
Forest Stewardship Program	**Source:** US Forest Service **Description:** Provides grant funding to enable preparation of forest management plans on state, private and tribal lands to ensure effective and promote efficient hazardous fuel treatment.
	More info: www.fs.fed.us/r1-r4/spf/montana/
Rural Community Assistance	**Source:** US Forest Service **Description:** Provides grant funds to rural organizations with involvement of local Forest Service offices for the development of community strategic action and fire risk management plans to increase community resiliency and capacity.
	More info: Dean Graham, Regional RCA Coordinator at 406-329-3230
Firefighters Assistance	**Source:** Federal Emergency Management Agency and US Fire Administration Program **Description:** Provides grant assistance to municipal and volunteer fire departments to help improve fire fighting operations, services, and provide equipment.
	More info: www.usfa.fema.gov/
Montana Forest Stewardship Program	**Source:** Montana Department of Natural Resources and Conservation **Description:** Program provides grant funding for non-industrial private forest landowners in meeting the demand for wood products and providing high quality management of their resources and develop forestry employment for the local community.
	More info: www.fs.fed.us/r1-r4/spf/montana/factsheet/02landownerassistance.htm
Community Facilities Loans and Grants	**Source:** Rural Housing Service (RHS) US Dept. of Agriculture **Description:** Provides grants (and loans) to cities, counties, states and other public entities to improve community facilities for essential services to rural residents. Projects can include fire and rescue services; including the purchase of fire-fighting equipment for rural areas. No match is required.
	More info: www.rurdev.usda.gov; or local county Rural Development office.
Sale of Federal Surplus Personal Property	**Source:** General Services Administration **Description:** This program sells, by competitive bid, surplus federal government equipment to individuals, businesses, and organizations. Normally, there are no use restrictions on the property purchased.
	More info: www.gsa.gov
Reimbursement for Firefighting on Federal Property	**Source:** US Fire Administration, Federal Emergency Management Agency **Description:** Program provides reimbursement to fire service organizations that have engaged in firefighting operations on federal land. Payments can be for direct expenses and direct losses.
	More info: www.fema.gov/

Table 12 – Assistance Opportunities continued

Program	Description
Fire Management Assistance Grant Program	**Source:** FEMA **Description:** Readiness, Response and Recovery Directorate provides grants to states, tribal governments and local governments for the mitigation, management and control of any fire burning on publicly (nonfederal) or privately owned wildland that threatens such destruction as would constitute a major disaster. The grants are made in the form of cost sharing with the federal share being 75 percent of total eligible costs. Grant approvals are made within 1 to 72 hours from time of request.
	More info: www.fema.gov/
Hazard Mitigation Grant Program	**Source:** Federal Insurance and Mitigation Administration, FEMA **Description:** Provides states and local governments with financial assistance to implement measures to reduce or eliminate damage and losses from natural hazards. Funded projects have included vegetation management projects.
	More info: www.fema.gov/
Butte-Silver Bow Fuels Reduction Program	**Source:** Western States Urban Interface Program. **Description:** Provides local grant cost share funding opportunities for private WUI landowners to reduce risk of losses from catastrophic wildfire hazards.
	More info: Terry Vaughn Ph. 406.563.6078

Table 12 – Assistance Opportunities continued

ACTIVE STAKEHOLDERS AND PLAN DEVELOPMENT

The Butte-Silver Bow County CWPP generation process has included the participation of many community entities. Generation of this plan has included the following primary stakeholders:

- Butte Fire Protection Association
- Butte-Silver Bow Fire
- Commissioners
- Disaster and Emergency Services
- Department of the Interior: Bureau of Land Management
- United States Department of Agriculture: Forest Service
- Montana Department of Natural Resources

Fox Logic invoked discussions with and received feedback from the public, private organizations, and federal, state, and local agencies to identify wildfire risks, priority areas, priority projects, and mitigation activities. Planning was based on verbal input from stakeholder meetings held during the spring of 2005 and written responses submitted to Fox Logic. Input from public stakeholder groups was additionally encouraged through solicitation letters sent directly to possible stakeholder groups and public notices published in local newspapers (Appendix A and Appendix B).

In mid-August 2005 a 1st Final Draft CWPP was circulated to six core stakeholders for review and comment. In early-September 2005, after recommended changes were received and incorporated from stakeholders, a completed Final version of the CWPP was posted via the Internet on the Fox Logic, LLC website. Notification of the Internet posting was issued through email/traditional mail notice to all previously identified stakeholders. Finally, copies of the completed Final Draft were sent to the HRC&D and County DES offices in Late-September 2005.

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FIGURES

APPENDIX